Summer 1983

NAVY CIVIL Engineer

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A candid appraisal of merit pay — page 16

Computer aided mapping becomes a reality — page 25

'They are going to have to kick me out' says this Navy man

His story is on page 20

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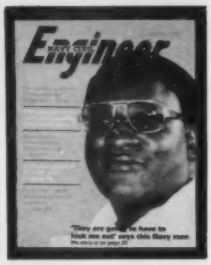

THE COVER

The gentleman pictured on the cover has an interesting story to tell of how he enlisted in the Navy to avoid the Army draft. Later he learned of the CEC and applied and was accepted. Then, what was to be just a temporary assignment turned out to be a lifetime career for LCDR Earnest R. Hunter, because he liked the CEC and the way his career was developing. He likes it so much that now he says, "They are going to have to kick me out." Cover photo was taken by the author of the story, J01 Stacy J. Huesmann. See page 20.

NAVY CIVIL Engineer

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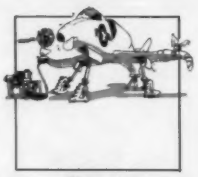

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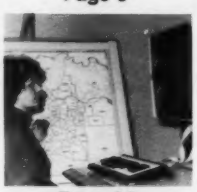

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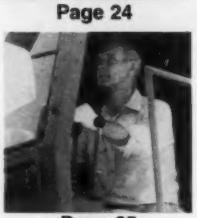

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Written by two judge advocates — for the non-legal mind — to serve as a practical guide for investigators in the Navy, consider . . .

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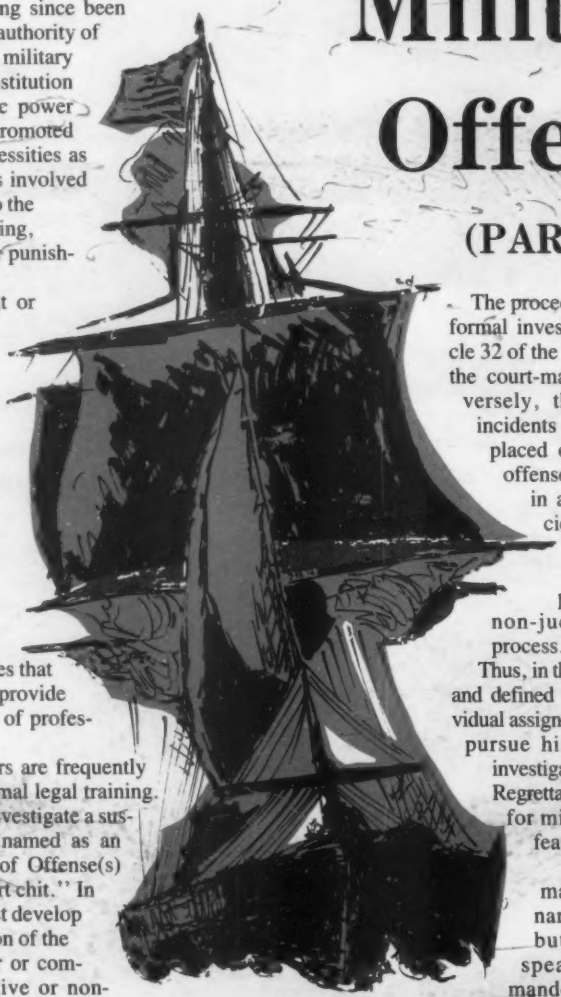
Investigating the Minor Military Offense

(PART I)

• San Bruno, Calif.



Although corporal punishment has long since been abolished in the United States Navy, the authority of a commanding officer to discipline all military personnel in his command through the institution of nonjudicial punishment is an historic power inherent in the office. Military law has promoted this relationship in response to such necessities as overseas deployment so that as to sailors involved in minor offenses, an inquiry is made into the allegations, the accused is afforded a hearing, and the charges are disposed of through punishment or dismissal.

A system of nonjudicial punishment or Captain's Mast has evolved from the summary treatment accorded suspects in Richard Henry Dana's era through "Rocks and Shoals" culminating in the Uniform Code of Military Justice (UCMJ) with its procedural safeguards.

In the Navy of the 1980's, the uniqueness of Navy life still warrants proper exercise of mast for minor offenses whether afloat or ashore. Yet justice within the military frequently depends on the actions and input of individuals whose primary mission is to build and to fight.

It is for these CEC officers and Seabees that this article is "passed down the line" to provide a practical approach to the serious task of professionally investigating minor offenses.

Junior officers and chief petty officers are frequently cast in military justice roles without formal legal training. Often these individuals are assigned to investigate a suspected offense by one who has been named as an accused on a Report and Disposition of Offense(s) form, otherwise referred to as the "report chit." In most cases, the investigating officer must develop a report which will be used for disposition of the matter by an accused's division officer or commanding officer through administrative or nonjudicial proceedings.

The investigation of more serious offenses under the UCMJ or actions which by nature must be decided in a court-martial forum invariably have the input of Navy Judge Advocates at the preliminary investigative stage.

The procedures which attend a formal investigation under Article 32 of the UCMJ are unique to the court-martial process. Conversely, the more mundane incidents of an accused being placed on report for minor offenses frequently result in an incomplete, deficient investigation by individuals who do not routinely participate in the non-judicial punishment process.

Thus, in the absence of training and defined procedures, the individual assigned is frequently left to pursue his own methods of investigating minor offenses. Regrettably, the opportunities for misfeasance and nonfeasance are legion.

The legal authority mandating a preliminary inquiry is broad but indecisive. In speaking of the commander exercising immediate Article 15 or mast jurisdiction, the *Manual for Courts-Martial, United States (MCM)* provides:

He will make, or cause to be made, a preliminary inquiry into the charges or the suspected offenses, sufficient to ena-

ble him to make an intelligent disposition of them. This inquiry is usually informal. It may be conducted by the commander or by a member of his command. It may consist only of an examination of the charges and the summary of the expected evidence which accompanies them. In other cases it may involve a more extensive investigation and the collection of evidence . . . .

The propriety of a commander exercising immediate non-judicial punishment jurisdiction over a suspected offender and also conducting the preliminary investigation will vary case by case. While there is no prohibition against administrative fact-finding by the commander, it is desirable for another individual to conduct the investigation to promote impartiality and independence. The person conducting the investigation will hereinafter be referred to as the Preliminary Investigating Officer or PIO.

Purpose in Appointing a PIO

The goals and ultimate purpose of such appointment are best determined by examining the function of a PIO. An analogy to a kindred investigator is not misplaced. Indeed, the informal investigator appointed in accordance with the *Manual of the Judge Advocate General (JAG Manual)* and the PIO are both administrative fact-finding bodies. Both have been employed to informally collect and record information on a particular topic by searching out, developing, assembling, and analyzing all available information regarding a specific incident.

A carefully prepared report developed by the PIO is not dissimilar from the findings of fact compiled by the *JAG Manual* investigator, particularly when references, enclosures, and/or witness statements substantiate the investigative report.

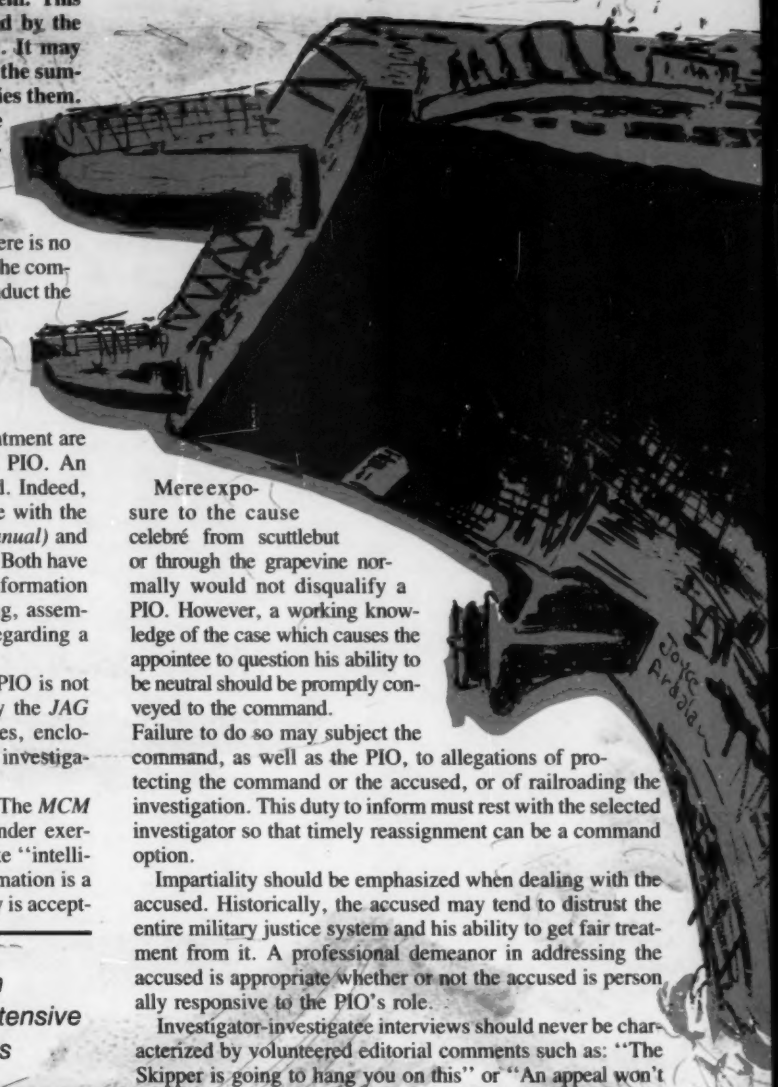
The PIO's duties are administrative in nature. The *MCM* requires a report which will enable the commander exercising (non-judicial punishment) authority to make "intelligent disposition" of the charges. Adequate information is a precondition to intelligent disposition. Informality is acceptable so long as the investigation is essentially complete. Additionally, in conducting the inquiry the PIO also must be on a quest for the truth. Indeed the *MCM* further emphasizes the responsibility as follows:

The evolution of seafaring justice in America has brought changes as extensive as the difference in America's ships

It is not the function of the person making the inquiry merely to prepare a case against the accused. He should collect and examine all evidence that is essential to a determination of the guilt or innocence of the accused, as well as evidence in extenuation and mitigation.

Clearly, the PIO is not expected to perfect a case for the government nor to develop facts to protect the command, but rather is obliged to conduct an impartial investigation. Impartiality in approach and treatment of the matter engenders completeness.

A neutral and detached approach is an ideal mode for the PIO. Whether previous knowledge of the case at hand taints the investigator is a factual question.



Mere exposure to the cause celebré from scuttlebut or through the grapevine normally would not disqualify a PIO. However, a working knowledge of the case which causes the appointee to question his ability to be neutral should be promptly conveyed to the command. Failure to do so may subject the command, as well as the PIO, to allegations of protecting the command or the accused, or of railroading the investigation. This duty to inform must rest with the selected investigator so that timely reassignment can be a command option.

Impartiality should be emphasized when dealing with the accused. Historically, the accused may tend to distrust the entire military justice system and his ability to get fair treatment from it. A professional demeanor in addressing the accused is appropriate whether or not the accused is personally responsive to the PIO's role.

Investigator-investigatee interviews should never be characterized by volunteered editorial comments such as: "The Skipper is going to hang you on this" or "An appeal won't even help you on this case", etc. Such gratuitous comments cause unnecessary cynicism.

From the outset until a specific recommendation as to disposition of the case is made, impartiality should be the hallmark of the PIO. And an investigator who has remained neutral, detached, and not gotten involved through prior knowledge or personality should have an easier choice in suggesting or recommending action upon completion of the preliminary inquiry.

Examination of the Evidence

The value of a complete preliminary investigation to the military justice process can be perceived through a PIO's examination of the evidence. Although there are restrictions on collection of evidence and examination of the accused, the informal preliminary inquiry and the more formal procedures followed during a pre-trial investigation conducted under Article 32 of the UCMJ are not unduly concerned with evidentiary matters. (However, the PIO should review the

rules regarding interrogations and search and seizure before collecting evidence.)

The PIO, like the *Jag Manual* investigator, can collect, consider, and include matters of reasonable believability or authenticity which are relevant. Hence, the PIO should not delete a statement from the report due to its character as hearsay.

Incredible, irrelevant, non-probative, and untrustworthy evidence may be discounted or excluded at a subsequent mast or court-martial, but unless there is the opportunity to consider the evidence, a shortcoming in the process has resulted.

The evidence in any particular case could be classified into categories such as testimonial, non-testimonial, real, documentary, direct, and circumstantial. For purposes of the preliminary inquiry, facts and circumstances of a minor military offense are most often proved or disproved by inferences drawn from real or tangible evidence, documentary evidence, and the statements of witnesses including the accused. A discussion of each of the three categories follows.

Real evidence is a "thing" in existence (e.g., bloody fatigues, "baggies" of controlled substances, or the layout of an assigned space) which tends to prove the existence or non-existence of a fact or allegation.

In some instances the items may be attached to the preliminary inquiry report. If this is infeasible the report should note the location of the real evidence.

Additionally, completeness dictates that known witnesses be interviewed to identify the evidentiary items. Not infrequently during a mast proceeding, an object presumed to have some probative value is not recognized by witnesses, who if questioned earlier, would have correctly pointed out that the item under scrutiny is not the article about which they gave a statement.

Such disastrous assumptions by the PIO result in an amateurish inquiry. Conversely, the PIO may earn high marks by preserving and physically safeguarding evidence which others overlooked. Incriminating evidence is highly pilferable by those who might be incriminated thereby. Hence, the PIO must be alert to sufficiently protect real evidence. When the physical layout of a room, compartment, or space is relevant, the desirability of including plans or charts of that space must be considered.

The PIO also should consider the value of his own observations and comment on evidence gained through impressions. As an investigator, what the PIO acknowledges and perceives has merit. In brief, a "hands on approach" vis-a-vis real evidence can be extremely useful.

Documentary evidence includes information presented in papers or documents which express facts in writing on a physical article. This type is often the most useful and available evidence. Writings which express facts may appear in many places and constitute different documents including more commonly: logs, records, diaries, reports, letters, and other investigations.

Documentary evidence in the nature of different official reports covering the same incident may be available to PIO's, e.g., Master-at-Arms reports, civilian and DOD police reports, entries in a watch log, or a Naval Investigative Service Report.

The PIO should maintain a mental tickler to locate, secure, and append all known releasable reports on any event. Such initiative assists the command in making an intelligent disposition of the case, as do the PIO's comments on consistencies or inconsistencies perceived in the collected reports.

A collateral concern of the PIO's is discovering additional documentary evidence through search and seizure. Although the PIO is tasked by the command and is therefore a governmental agent, he also is obliged to use his best efforts to remain neutral and detached during the inquiry. Hence, if the PIO becomes aware of evidence located in an area where there is a reasonable expectation of privacy, the command should take the lead in ordering a search if deemed necessary.

It is not the PIO's job to seize evidence in lieu of a command authorized search based upon probable cause for the very practical reason that it detracts from the open-minded nature of the inquiry. However, this should not limit the PIO from receiving evidence voluntarily from individuals.

The testimony or statements of witnesses to the alleged offense comprise the majority of the third broad category of evidence. The witness may have already made a statement or the PIO may be seeking a statement for the first time. Conducting an interview with a witness may put both the PIO and witness ill at ease. Some considerations for making an interview productive follow.

First, put the witness at ease. The witness might be asked some incidental or background questions for this purpose to become "settled in." Secondly, the witness must be informed of the charge, circumstance, incident, or individual being investigated.

Finally, ask the witness to recount the story in his own words, just as it happened, i.e., what were his perceptions of any alleged illegal act. If the PIO can avoid interrupting the witness when he is initially relating the facts, experience has demonstrated more facts will be recited.

After this initial "run through" of the facts, then the PIO should question the witness on the details of his story with a view toward bringing out points or issues which were overlooked or dismissed as immaterial by the witness. Of course, the PIO must never suggest the existence of facts which are not present in the witness' understanding.

Next, the witness should reduce his statement to writing and although suggestion is inappropriate, dispassionate coaching of the witness may assist him in writing his statement. The witness should exclude material that is clearly repetitive or irrelevant while the PIO attempts to develop omitted facts. However, the witness should be allowed to phrase the statement in his own language.

Once a statement has been reduced to writing, have the witness read it back. Any corrections to the statement should then be made and finally he should sign and date the finished product.

PIO's do not have the authority to swear witnesses and hence the witness' statement which evolves is unsworn. However, this limitation should not forestall attempts to glean truthfulness and accuracy in witness statements.

While the burden for truthfulness is on the witness, the PIO should exhort the witness to accurately present the facts. At times, this action might take the form of stressing the consequences to others if military justice is not treated seriously. □

**To Be continued.
Look for Part II
in the Fall Issue**

ENERGY

Navy housing at Key West, Florida

Conservation

A major energy user, the Navy knows it has large conservation potential — but where?

• Charleston, S.C.

Navy housing is a major energy user, with tremendous conservation potential. To date this conservation potential has not been tapped, primarily due to a lack of understanding of where the conservation potential exists and of the effects conservation will have on housing occupants.

Navy housing occupants are currently entitled to the use of unlimited utilities without charge. One of the utilities used by occupants is air conditioning (AC) which has traditionally been oversized. This comes from the false general belief that more AC capacity is always better and that sufficient oversizing will solve any AC problem. These factors combine to complicate conservation efforts for Navy housing.

Since occupants in Navy housing pay no utility bills, they tend to enjoy and overindulge in the use of energy consuming equipment at their disposal resulting in high energy use per capita. With high energy consumption comes pressure to conserve.

Conservation initiatives have always been enacted as attempts to manage the housing occupants and bridle their energy use, instead of engineering solutions to provide the same service at greater efficiency and reduced consumption. This is partially because it is easier to write directives which have immediate limited effect than to generate energy conservation projects which must be tracked for years and constructed before benefits are realized. Administrative efforts disgruntle occupants, however, and have limited conservation potential. Beyond the conservation potential of administrative efforts, conservation retrofit projects have the potential to: further reduce energy consumption by 50%; reduce electrical demand and associated charge by 50%; reduce maintenance requirements to a fraction of existing levels; and increase occupant comfort and satisfaction.

By B. H. BARKER
P.E., Va.
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Southern Division, NAVFAC

It is important to note that oversized AC is not a blessing. Following are the characteristics of oversized AC:

- Lower levels of comfort are experienced in humid areas because the AC runs an insufficient time to dehumidify the space served.
- Oversized AC costs more to purchase. The difference in cost between properly sized equipment and oversized equipment could be more wisely spent on conservation measures than increased AC capacity.
- Oversized units usually have shorter life expectancy than proper sized units.
- The maintenance cost is higher for oversized equipment.
- Larger units make more noise. Noise is of particular consideration in high density housing.
- The more frequent cycling of oversized equipment results in actual efficiency that is lower than the rated efficiency. This increases energy use for the same amount of cooling.

The above is intended to emphasize that more AC is not always better and, in fact, oversized equipment increases costs and wastes energy throughout the equipment life while providing comfort levels that are lower than those achieved with properly sized AC units.

Housing at Key West offers tremendous potential to save energy. Because of the subtropical climate, high utility rates, and the low resistance to the flow of heat through the existing windows, walls, and roofs. The existing AC equipment is from 12,000 to 18,000 BTU/Hr oversized for the as-built AC loads.

Therefore, minor load reductions or efficiency improvements result in pronounced energy and dollar savings. Additionally, existing units have reached their service life and require replacement whether or not energy conservation is involved.

Anytime an energy conservation project is developed for housing, it is important to improve efficiency in ways that do not require occupant participation or reduce occupant comfort. The first step in developing the Key West project was to determine what actions could be taken to improve building shells and reduce AC and heating loads.

A load study was performed that verified existing systems to be oversized. It also indicated the portion of the total cooling/heating load contributed by each component of the building shell. Only a small portion of the total load was caused by exposed wall area.

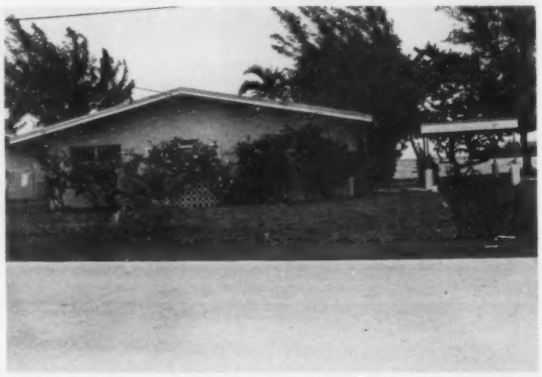
Because of temperature differences and solar loads, the largest AC load is contributed by glass area and the second largest load is caused by roof area. In evaluating insulation levels which should be achieved in the attic/roof, it was determined that with the economic analysis based on insulation alone, ceiling R values greater than 30 could not be justified. When AC and insulation were evaluated together, however, R values of 40+ were justified. This is because part of the expense of insulation is recovered in the reduced cost of smaller AC equipment permitted by the added insulation.

Attic insulation varies from no insulation to approximately 3″ actual thickness. It was determined that R-30 insulation should be added to housing units with attics which will result in R values of between 30 and 41 after construction. Units without attics currently have no insulation installed and are space limited to a total insulation R value of R-19.

As noted, glass is the largest single contributor to AC load in Key West housing. When deciding upon an appropriate glass treatment, several things were taken into consideration. In many cases, window walls face to some extent east or west where they cannot be effectively shaded by overhangs.

Considerable glass overlooks the water. This results in significant solar gains reflected from the water. It also results in outstanding views which should not be obscured. Another consideration is the fact that occupants are more likely to adjust the thermostat than adjust solar gain control devices such as blinds, drapes, or sun shades, if they become warm.

The retrofit option selected for glass includes double glazing with storm glass and the installation of solar film. The second glazing doubles the R value of the glass and reduces the AC load imposed by the indoor/outdoor temperature difference by 50%. The solar film reduces the direct and indirect radiant gain in summer or loss in winter by approximately 75%.



Housing at Key West offers big potential to save energy because of the sub-tropical climate and high utility rates.

This glass treatment results in an average AC load savings of 12,000 BUT/Hr per housing unit. This represents a savings of approximately $750 in required AC capital cost per house which can be applied to the glass treatment before overall project cost increases. The film will, where possible, be installed on the inside surface of exterior storm windows/doors. This will maximize the efficiency and protection of the film.

Wall insulation and exterior shading were considered but found to have ineffective savings to investment ratios. After deciding on insulation and glass treatment and determining the AC load reduction resulting from these actions, the next step was to determine the best method of providing the required AC capacity.

For the Key West project, numerous options for providing the required AC and domestic hot water at increased efficiency were considered.

The AC capacity required by housing at Key West is greatly reduced after the application of conservation measures. The new AC loads for most buildings are less than 21,000 BTU/Hr with some units requiring as little as 9,000 BTU/Hr. Since the normal AC system used in housing is split system AC with air cooled condensors, this is the system used as the basis for comparison to other systems evaluated.

In establishing the base line, the smallest air cooled AC (AA) units that can be provided by three vendors and provide reasonable efficiency is approximately 18,000 BTU/Hr at a seasonal energy efficiency ratio (SEER) of 8.7.

AC units, which use refrigerant in coils to cool the air, are called direct expansion units (DX). The AA units above are of the DX type. Another type of DX unit is the central DX unit where one condensing unit serves several air handling units (AHU's).

At Key West each house will have one AHU. The central DX system did not prove to be cost effective and was not recommended due to problems with efficiency and control at light load conditions. A system which initially appeared attractive for the Key West area is one of water cooled AC in which heat is rejected to a water cooled condensor coil in lieu of one cooled by air.

There are two types of residential size water cooled AC units available. One is a water cooled DX unit or water to air (WA) type. The other has a water cooled condensor but cools water which is circulated through coils to cool the air. This is a water to water (WW) unit. The WA units have characteristics similar to AA units outlined above including one compressor per unit, insufficient latent control, etc.

The cleaning of WA condensors should be performed every one to three years depending on water conditions. This is an added maintenance factor for which plans must be made. Failure to clean the condensors leads to low efficiency and early compressor failure as with AA units with corroded coils.

While SEER's of nearly 20 are claimed by the manufacturers of WW equipment, actual SEER's are closer to 13. This is because the energy required to pump water through the condensor and the evaporator is not considered by manufacturers when rating their equipment. This is also the case with WA equipment. Because the compressors use relatively little energy in WW equipment, the efficiency is very sensitive to the energy requirements of ancillary equipment. The pumping and fan requirements may be 50% of the total energy requirements on a WW unit. However, SEER's of 13 are much better than those provided by either WA or AA units.

The Key West project evolved in the following manner: Since both WA and WW units are more efficient than AA units, they were evaluated. The WW units require the same water source as the WA units but have other advantages including higher efficiency which make them a better technical choice than WA equipment.

In analyzing the WW equipment, it becomes obvious that its viability is very sensitive to the cost of providing the required cooling water.

At Key West, using domestic water for this purpose is not possible due to its cost and short supply. Brackish water available from a porous acquifier approximately 50-feet deep is a very good source of cooling water. The AC equipment is designed to handle salty or otherwise corrosive water. Cooling water is obtained from one well and reinjected into another well after use. The cost of wells is a major expense, though, and a well per unit is not cost effective for the small units required at Key West. Larger wells provide more water for the money than small wells.

It was determined for the housing densities at Key West that maximizing the number of houses served by one well minimized the cost per house. The evolving design indicated

The first step in developing the project at Key West was to determine what actions could be taken to improve building shells and reduce AC heating loads.

that major blocks of housing should be supplied from one 12-inch well with a similar well for reinjection of the discharged water. Economic analysis of this system proved it to be no better than AA equipment because the additional energy savings of the WW units is offset by the additional cost of the system.

The maintenance problem of a condensor for each housing unit is the same as with AA equipment. Also WW equipment comes in size increments of 20,000 BTU/Hr starting with a 20,000 BTU/Hr unit. This means that equipment does not match loads requiring 20,000 BTU/Hr equipment for 9,000 BTU/Hr loads and 40,000 BTU/Hr equipment for loads in excess of 20,000 BTU/Hr.

The analysis of WW units proved that for high density housing a water distribution system is feasible, but no better than AA systems unless energy savings can be further increased and other improvements can be made. With this in mind, a central chilled water system was evaluated.

The central chiller rejects heat in the condensor to a water source and chills water on the evaporator side which is circulated to AHU's serving the various loads. The central chiller is more efficient than other systems investigated having a SEER of approximatey 16. It has lower maintenance per ton requirements than other systems, drastically reducing the number of components requiring service, can take advantage of load diversity minimizing the capacity to be purchased, allows matching total load to equipment capacity accurately, and provides all of the other advantages of water systems already indicated for the WW units.

This system meets the requirement for a higher efficiency, lower maintenance system with enhanced capabilities required to make a central system viable. Analysis proved the central chilled water system to be the best system evaluated, resulting in its selection for the Key West project. Additionally, a domestic water heating system was integrated with the central chilled water system, enhancing the overall project.

Details of the project as recommended for Key West housing are described. The central chillers will have ground water cooled condensors. A chiller with CuNi or monel tubes which is required to prevent corrosion by brackish well water will cost more than a standard unit. This cost is more than compensated, however, by savings derived from not having to purchase a cooling tower. With no cooling tower,

savings in fan horsepower, pumping costs, domestic make-up water, water treatment, tower maintenance, and fan noise will be achieved.

Chilled water produced by the chiller will be distributed to the housing units via a PVC piping system. The pipe will not corrode, has low friction and associated pumping losses, and should remain trouble free for at least 25 years.

The AHU for each house served by the chilled water system will be designed to match the loads and provide good humidity control. This will require multiple speed AHU fans and coils of at least five pass and low pressure drop on both the water and air side.

Control of space temperature will be achieved through the following operating sequence:

- With the thermostat set in the cooling position, chilled water will flow unrestricted through the AHU coil. Upon a rise in space temperature above the thermostat set point, the thermostat will activate the AHU fan at a slow speed circulating air over the cooling coil. Upon a further rise in temperature, the thermostat will activate second stage cooling which changes the fan speed to high increasing cooling capacity. Falling temperature reverses the sequence. The two stage cooling greatly improves mild season performance and humidity control, allowing comfort at higher energy saving thermostat set points.
- Setting the thermostat in the heating position will cause the water flow to continuously bypass the AHU coil. This maintains proper flow through the chiller when a portion of the housing units are heating and a portion are cooling. Upon a drop in temperature below the thermostat set point, the thermostat will activate the high speed fan circuit and energize electric strip heat. The fan and strip heat will be secured when the thermostat is satisfied.

Electric strip heat was selected for Key West housing even though it is very inefficient because it proved to be the most cost effective system of heating evaluated. This is a situation which may be fairly unique to Key West. The reason for its use in the Key West project is the low life cycle cost produced by low initial cost and minimal use after installation. After the house shells are improved, the heating loads are so low that heating is only expected to be required during exceptionally cool winters. Normally internal loads such as people, cooking, TV's, etc., will be sufficient to heat the houses.

The Key West project also includes a unique system for heating domestic hot water. The system selected uses 80,000 BTU/Hr WW heat pumps to heat water for groups of houses numbering approximately eight per heat pump. Except for being larger, these are the same as the WW units considered earlier for cooling. This design requires shorter runs of smaller piping, reducing costs and minimizing the amount of mechanical equipment to be purchased because several units are served by one WW unit.

Because the WW units have the capability of raising source temperatures of 40°F, to 140°F at high efficiency, it was decided to use water from the chilled water system in lieu of well water as the heat source. Water from the central chilled water system return water piping will be pumped to the WW units by a small in-line circulator.

The WW unit will extract heat, and return the cooler water to the central system. Normal conditions would consist of 55°F entering water and 45°F water leaving the WW equipment and returning to the central chilled water return piping.

This 45°F water will mix with the water in the central system producing a slightly lower average water temperature. This allows the central chiller to use less energy since a portion of the cooling requirement is met by the WW units while they are heating domestic water.

The heat extracted from the chilled water system will be elevated to 120-140°F and circulated through domestic hot water tanks connected to the WW heat pump.

In the economic analysis of this system, all of the energy used by the WW heat pumps is charged to heating domestic water. The cooling produced is considered free. Because both the heating and cooling produced by the WW units is utilized, the overall system efficiency is very high.

Another advantage of this system is that domestic water is circulated through the WW unit condensor with minimum heat rise, and treated closed system chilled water is circulated through the evaporator of the WW unit. This means that fouling and maintenance should be minimal.

Preliminary calculations indicate that, because of diversity between the WW heat pumps and the central cooling system, only approximately 15% of the WW capacity will be utilized by the cooling system in meeting the peak cooling loads.

For the Key West application, this, along with normal house to house diversity, allows the chiller to be only 40% of the total capacity that would be installed if individual AA equipment were used in the same housing. During off cooling peak periods, the WW heat pumps provide a higher percentage of the total cooling load. Average load on the central chiller is expected to be approximately 34%. For this reason, added capacity control must be utilized. The capacity control must be in addition to the normal control vane which only allows stable operation down to approximately 30% of maximum load.

Hot gas bypass is a method of capacity control which should not be used because it reduces the cooling capacity without decreasing energy use, resulting in very inefficient operation. Solid state motor speed controls will allow efficient operation at light loads but are expensive.

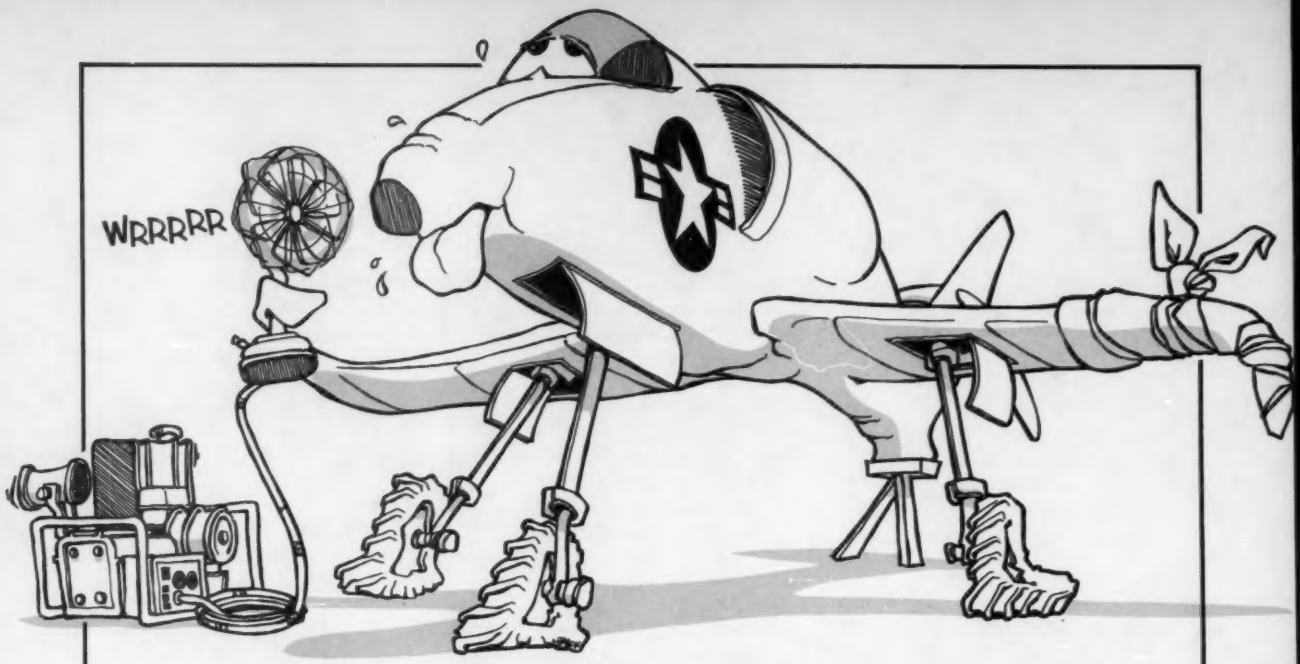
The option which will be used for added capacity control at Key West is multiple speed motors. This is the most cost effective means of achieving efficient capacity control to less than 10% of full load.

In summary, approximately 1000 units will be provided with central systems including the WW domestic water heating heat pumps and the glass and insulation improvements as outlined.

The advantages of the central system include very high efficiency, more reliable equipment, shorter down times and easier repair than conventional systems. Much better electrical demand control is provided by central systems than individual units.

The central system costs more to install but returns the added cost very rapidly through extra energy savings. Central AC systems should be considered as retrofits for high density Navy housing in other locations.

The system to be installed in Key West will meet reduced AC loads resulting from shell improvements at over twice the efficiency of existing equipment and reduce maintenance requirements. As a result, over 75% of the energy currently consumed to provide hot domestic water, AC and heat at Key West will be saved. □



Utility services for tired aircraft can save dollars with 'Fixed Point Utility System'

By RONALD E. NIEMI,
P.E., Wis.
Project Manager,
NAVFACENGCOM HQ

• Alexandria, Va.

Aircraft ground support requires a supply of utility services at hangar and parking apron service points. These utilities include cooling air, starting air, utility air, 400-hertz and 60-hertz electrical power. The function of the cooling air system is to provide conditioned air on the flight line or in a hangar for on-board avionics, electronics, computers, and more.

The starting air is for starting the aircraft and the utility air is for shop equipment. The 400-hertz power supplies power for the on-board electrical systems and the 60-hertz supplies motor powered ground support equipment and other equipment external to the aircraft. These utilities are presently being supplied by mobile ground support equipment (GSE) or non-standard flight line electrical and air distribution systems.

However, these systems are not providing reliable service, are becoming obsolete, have a high maintenance cost and require considerable manpower.

Accordingly, NAVFAC has completed a study to determine and evaluate various design concepts for the supply and distribution of aircraft cooling air, starting air, shop air, 60-hertz and 400-hertz electrical power (to aircraft positions in the hangar and on adjacent parking apron) all from a central location.

This concept of providing aircraft ground support utilities from a permanent centralized location and distributing these utilities to stationary service points in the hangar and on the parking apron is known as a Fixed Point Utility System (FPUS).

The results of the NAVFAC study indicate that considerable cost savings can be realized from implementation of these fixed point utility systems. It further concludes that differences that exist in aircraft types and operational group requirements do not preclude general design criteria allowing standardization of basic system components and installations.

The initial construction cost of hangars and parking aprons will be increased considerably due to the construction of FPUS but the additional capital costs would be more than offset by the elimination of costly, obsolete, portable ground support equipment. This initial cost of installation, however, remains an obstacle in the MCON Programming process.

NAVFAC through its Atlantic Division, is presently in the process of designing an FPUS system for the Naval Air Station, Oceana, Virginia. The project is anticipated to be funded in the FY85 MCON program at an estimated cost of $5,000,000 and will have a payback of approximately 5.8 years. □

technical notes

departments

One light switch for each work station most economical

Detailed economic studies of trade-offs between fluorescent lamp replacement and electric costs have shown that any time a room is vacated for more than a couple of minutes, the fluorescent lights should be turned off. It is, therefore, a good habit to turn off the lights upon exiting a room.

There are times, however, when even those individuals who habitually turn off lights do not do so. These situations arise when exiting the public areas of a building.

Public areas include such spaces as conference rooms, reproduction rooms, restrooms, and corridors. Because no one usually knows who will be the last individual to leave a public area, the responsibility for turning off lights is not easily assigned.

On the other hand, people think of their offices or work stations as their own private areas. Management can make them responsible for turning off the lights because it can hold them accountable. This works best when light switches are conveniently located, and ideally where there is one light switch for each work station. This is the most economical way to control lights for occupancy.

For those spaces where light switches are not providing adequate control of the lights, an alternative is available — electronic occupancy sensors that automatically turn off the lights after a room has been vacated. The most favorable applications are in the public areas of a building.

Most occupancy sensors sense the presence of persons in a space by detecting motion. The two common detection techniques employed are ultrasonic and passive infrared.

Ultrasonic occupancy sensors generate a low-level ultrasonic tone. A detector on the occupancy sensor receives the echo of the ultrasonic tone. A Doppler frequency shift in the received tone indicates motion in the space. The Army Environmental Health Agency has reported that the low level of sound used for this application and generated from properly mounted units presents no hazard to health or hearing.

Every object radiates heat. Passive infrared occupancy detectors sense the radiant heat patterns within a room. Since people also generate and radiate heat, their movement within a space changes the heat patterns detected.

Ultrasonic occupancy sensors are most sensitive to motion towards the sensor or away from it. Motion lateral to the sensors produces little Doppler shift and thus is often undetected. Passive infrared occupancy sensors, on the other hand, are most sensitive to lateral motion and relatively insensitive to motion towards or away from the sensor. If a person moves towards or away from a passive infrared sensor, the heat pattern generated appears to the sensor to have increased or decreased only slightly in size and is thus often undetected.

Occupancy sensors usually have two adjustments. The sensitivity control setting depends on the size and shape of the room. A small light emitting diode, which lights up when the unit is detecting motion, allows the sensitivity setting to be easily adjusted during installation. The time delay is the other adjustment provided. It is required since occupants sometimes perform work with insufficient movement to keep lights on.

Manufacturer's literature should be studied for guidance on proper mounting and sensor location. Ultrasonic sensors may be sensitive to air movement and passive infrared sensors may be sensitive to heat from radiators, diffusers, and lights. These considerations may reduce the number of possible sensor locations in a room.

The last area of consideration is the failure mode of the occupancy sensor. If the sensor is designed to fail leaving the lights on, it is only necessary to wire the occupancy sensor in series with a light switch. If the sensor is designed to fail leaving the lights off, then a manual override should be installed to bypass the sensor.

Recommendations

- Occupancy sensors should be used in rooms where ordinary light switches have been ineffective. These usually are the more public areas, such as conference rooms, restrooms, reproduction rooms, and circulation areas. In the more private areas, conveniently located light switches are generally more economical.
- Payback periods will vary greatly depending on load and occupancy. An occupancy sensor might control 15 fixtures in a conference room, but only two fixtures in a reproduction room. Installed cost will be approximately $1 to $2 per square foot. Even if applications in some public areas result in a poor payback, installation of occupancy sensors is still highly beneficial since they help remind personnel to turn off the lights. This is particularly true for those applications which can have short time delay settings.
- In active areas, such as a reproduction room, time delays can be set at about 5 minutes. For other less active areas, time delays will need to be set at 15 minutes minimum. These are initial settings; further adjustments may be necessary in some spaces in order to obtain desired operation.
- Naval Civil Engineering Laboratory tests have not detected any clear-cut performance differences between the ultrasonic and passive infrared units tested. It is important to understand the basic motion detection principles for best application to a specific space. Also, manufacturers provide guidance for proper mounting and location of sensors, which help in making the decision as to which units to specify.
- Since even the best automatic control may fail, consider what type of manual override control should be used in conjunction with the occupancy sensors.

For additional information, contact William Pierpoint, Code L62, Naval Civil Engineering Laboratory, Port Hueneme, Calif., Tel: Autovon 360-4660; FTS 799-4660; Comm (805) 982-4660. □

Maintaining shore-to-ship steam quality — future challenge of the program called . . .

By William F. Lintner
NAVFAC HQ

• Alexandria, Va.

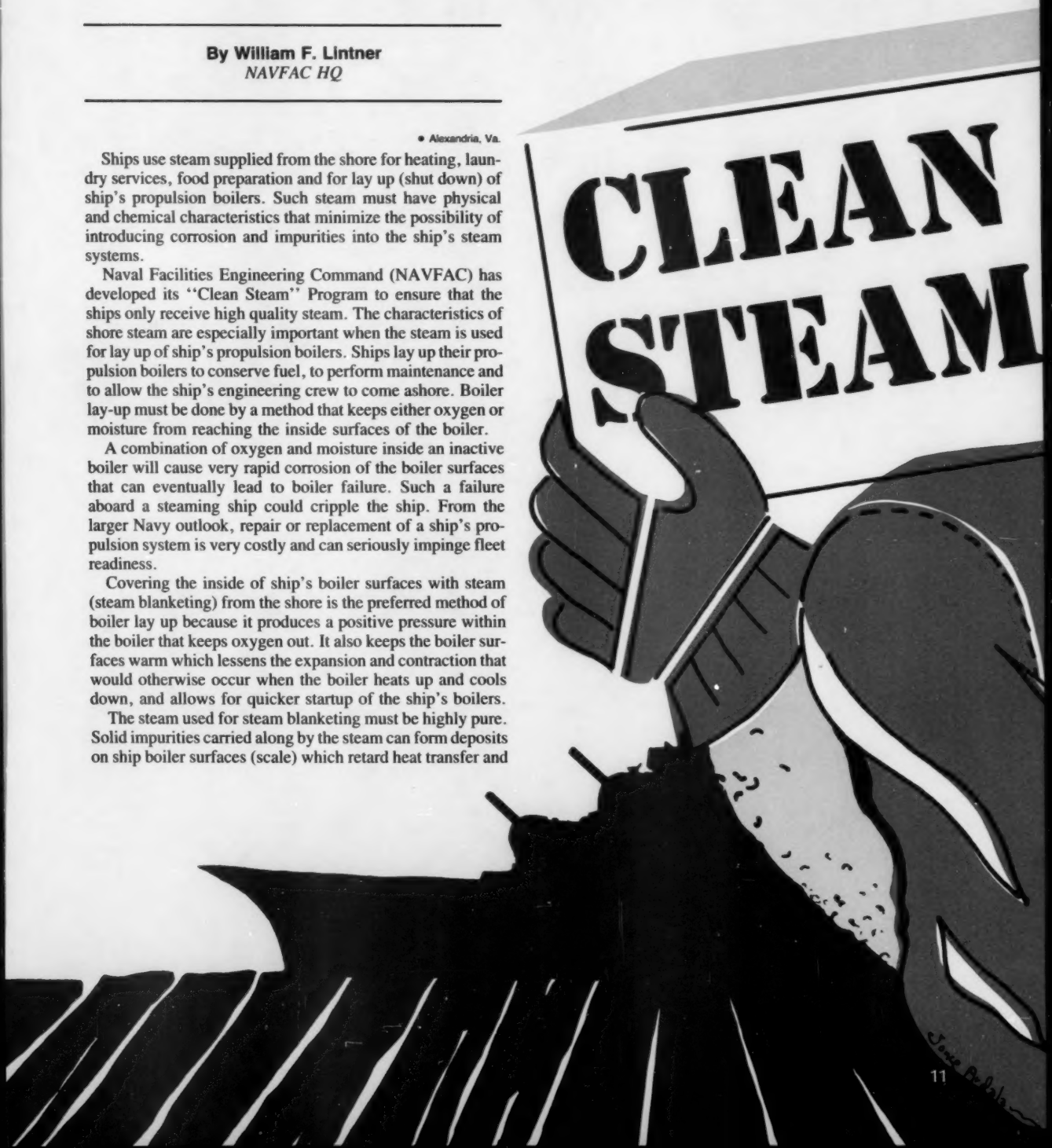
Ships use steam supplied from the shore for heating, laundry services, food preparation and for lay up (shut down) of ship's propulsion boilers. Such steam must have physical and chemical characteristics that minimize the possibility of introducing corrosion and impurities into the ship's steam systems.

Naval Facilities Engineering Command (NAVFAC) has developed its "Clean Steam" Program to ensure that the ships only receive high quality steam. The characteristics of shore steam are especially important when the steam is used for lay up of ship's propulsion boilers. Ships lay up their propulsion boilers to conserve fuel, to perform maintenance and to allow the ship's engineering crew to come ashore. Boiler lay-up must be done by a method that keeps either oxygen or moisture from reaching the inside surfaces of the boiler.

A combination of oxygen and moisture inside an inactive boiler will cause very rapid corrosion of the boiler surfaces that can eventually lead to boiler failure. Such a failure aboard a steaming ship could cripple the ship. From the larger Navy outlook, repair or replacement of a ship's propulsion system is very costly and can seriously impinge fleet readiness.

Covering the inside of ship's boiler surfaces with steam (steam blanketing) from the shore is the preferred method of boiler lay up because it produces a positive pressure within the boiler that keeps oxygen out. It also keeps the boiler surfaces warm which lessens the expansion and contraction that would otherwise occur when the boiler heats up and cools down, and allows for quicker startup of the ship's boilers.

The steam used for steam blanketing must be highly pure. Solid impurities carried along by the steam can form deposits on ship boiler surfaces (scale) which retard heat transfer and



can cause the boiler to overheat and fail. These solid impurities can also be carried over from a ship's boiler and deposited in the ship's propulsion turbines causing possible failure.

Vaporous substances such as carbonic acid (formed by the breakdown of bicarbonates in boiler water) can condense in the boiler and cause acid corrosion. Acid corrosion can be doubly dangerous because the rate of oxygen corrosion increases rapidly under acidic conditions.

Properly operated boilers under normal conditions do not carry over any significant amount of solid impurities. However, load swings, equipment failure and operator error will increase carryover of impurities. In a dynamic setting, such as a port, carryover will inevitably occur from time to time.

Naval Sea Systems Command (NAVSEA), in trying to protect the ship's propulsion boilers from corrosion and scaling, has placed increasingly strict requirements on shore-to-ship steam.

In the 1960's and early 1970's shore-to-ship steam requirements included a pressure of 150 psig and the ability to meet ship demand.

In the late 1960's, with the introduction into the fleet of destroyers with 1200 psig propulsion boilers, the requirements were tightened because of the greater accident risk and higher cost of equipment failure associated with these high pressure boilers.

NAVSEA placed purity limits upon shore to ship steam, but the limits were not very stringent and most shore activities could easily meet the requirements.

In June 1981, NAVSEA issued further revised steam requirements that afterwards became known as "Clean Steam." They are:

Property of Constituent	Requirements
pH	8-9.5
Conductivity	25 micromho/cm max
Dissolved silica	0.21 ppm max
Hardness	0.1 epm max

These are stringent quality standards and are significantly more difficult for shore activities to achieve than any of the previous requirements. To ensure that shore facilities are supplying clean steam they are required by the Naval Ships Technical Manual to perform and to provide upon request to a ship copies of the results of:

- Daily laboratory tests certifying steam at the shore boiler discharge.
- Quarterly laboratory tests certifying steam quality at each pier or quay.

For the activities supplying steam to ships there is the problem of magnitude as well as quality. This is due to the complexity of both the ship and the shore steam systems. Some ships have their laundry, heating and galley steam systems interconnected with their propulsion systems.

Sometimes the shore plant supplying shore-to-ship steam also supplies the heating and process steam for all or part of the shore installation. The result is a much larger amount of clean steam generated than would otherwise be needed for steam blanketing alone.

NAVFAC created its Clean Steam Program to identify deficiencies in shore-to-ship steam services and to help shore activities to solve their clean steam problems. When the 1981 requirements were implemented, NAVFAC promptly directed its Engineering Field Divisons (EFDs) to:

- determine which activities supplying shore-to-ship steam could meet the requirements
- determine what modifications were needed at each activity to meet the requirements
- assist activities in developing projects to correct any deficiencies.

To accomplish this, NAVFAC directed its EFDs to provide engineering studies upon request to the activities. The Chief of Naval Material required that the studies be accomplished on a reimbursable basis.

To more effectively use EFD services, NAVFAC notified the major claimants of the availability of assistance in meeting clean steam requirements and requested that they prioritize their activities for the EFDs.

The centerpiece of NAVFAC's Clean Steam Program is the Clean Steam Management Report. The report identifies the activities affected by clean steam requirements, whether or not steam (and feedwater) supplied to the ships meets clean steam requirements, and the status of engineering reports and projects needed by activities to achieve compliance with the requirements.

The EFDs update their portions of the report quarterly and send it to NAVFAC for consolidation and review. Afterwards the consolidated reports are sent back out to the EFDs so that they can pool their knowledge and experiences. The report is also sent to the major claimants, NAVSEA and various NAVFAC organizations so that they can evaluate the progress made.

To date, there have been 10 engineering studies completed, 12 projects initiated, and 16 clean steam certifications.

The report and engineering studies received so far have indicated that additional chemical treatment of the feedwater going to the shore boiler is necessary in most cases to raise the shore-to-ship steam's pH to within clean steam pH range.

The added costs associated with providing chemically pure water to the shore boiler plant depends upon the initial purity of the water received and the extent to which the facility is already cleaning up its water.

Some facilities are already removing acidic or basic ions from the water going to their boiler plants and require only minor changes in the type of system they are using. Other facilities are modifying existing contracts for demineralized water with private contractors to increase the amount of water they receive.

The production of clean steam also provides some benefits to the shore boiler plants. There is less energy loss because of a decrease in the frequency of boiler blowdown. Also with cleaner feedwater coming into the boilers, impurities will take longer to build up to levels requiring boiler blowdown.

Steam distribution lines will be cleaner and require less maintenance. Because of the cleaner watersides of the boilers, the boiler efficiency should increase. This will save the activity money on energy and maintenance costs.

Maintaining the shore-to-ship steam quality will be the future challenge of the Clean Steam Program.

By providing this engineering advice and assistance, the NAVFAC community will make a significant contribution to enhanced ship's readiness and will fulfill the needed role of fleet support. □

Eliminate corporate confusion and waste.

Implement the Project Information Cycle Control/Planning Technique

BY LCDR KEVIN F. MCNAMARA, CEC, USN
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• Yokosuka, Japan

The link between the project manager's idea of project information requirements and executive management's idea of project information requirements is often hazy, assumed, or never consumated. Project information cycle control and prior planning can eliminate the information continuity problems of a project.

A hazy connection exists when some management communication takes place but understanding of informational transfer needs is never reached. Briefness of communications or remoteness of project operations often contributes to misunderstanding of information needs.

An assumed link often exists. The project manager will assume executive management needs certain information. Assumption is based on company experience, standard company procedures, informal discussions, or a well-meaning attempt to please executive management without prior communication of needs. An assumed information link is prevalent in most corporations.

An information link may never be consumated. The project manager may retain all information within the project management structure, awaiting executive management's request for information. The request never comes. The project manager may avoid information processing as too much paperwork and also may not promote continuity of paperwork. Communications may be informal in a smaller corporation. No formal transfer of information occurs.

A fourth source of information breakdown can cause any of the above situations. Most functional information systems are computer based. Computer use is controlled by an electronic data processing (EDP) manager who has a powerful tool to assist information flow. Often, capabilities and responsibilities are not fully understood by other managers. Lack of understanding can result from fear of computers, too much knowledge of computers, resistance to management of computer input requirements, or impatience. The wise project manager will confine personal involvement to formulating input required to achieve a desired output. Data processing and management should be left to the EDP manager.

The above sources of information breakdown can be overcome by proper control and planning by the project manager. The management of material resources availability, manpower resources availability, time, and money must also include information management. The goal of information control and planning is to provide clear and timely decision quality information for control of the remaining management parameters.

Data Base/Bank

The data base is not a magical or mysterious system. It is a large filing system for project data elements. The data base can be one computer at a project site or a larger composite system. The essential elements for a large system are a corporate historical filing system; a contract data filing system (optional); and newly generated project data.

Most large data filing systems are random access type. Random access means the manager may look at any one file without looking at other files in the filing system. (The other type of data base is a sequential system in which the manager looks at all files stored before the file he wants.)

Different Categories of Data Bases

- file handling systems
- heirarchical storage systems
- network systems, and
- relational systems.

A file handling system is an unstructured system. Information is accumulated and sorted.

Hierarchical storage means that to find a single piece of data, a manager must first select a category of information. Then he must search sequential subcategories until the desired information is found. This system is too rigid for most project management applications.

The network system allows the project manager to use any one descriptive data element such as activity name to find activity related information. This system also allows the activities subcategories such as cost to be compared with all other similar activity elements of cost.

The relational system is more expensive and harder to formulate than other systems. The relational system relates data elements through mathematical formulae. The result is a more sophisticated use of data in storage. Relational storage is normally more than a project manager will require to achieve decision quality output.

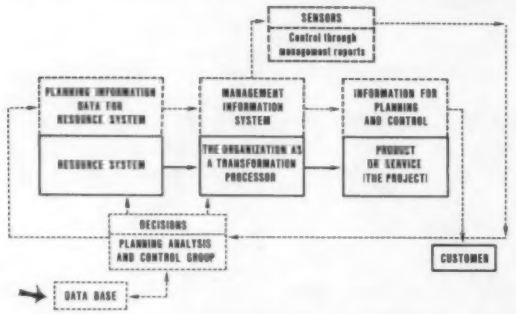
The project management data base of choice is the network system.

Management Information System

The management information system (MIS) sees a single project (or activity) as part of an overall corporate network of many projects and other corporate elements, i.e. staffing, etc. The project manager has two avenues for forwarding decision quality information to executive management.

Method one occurs daily through departmental/divisional meetings through face to face verbal/visual briefings. Briefs are based on project level output.

Method two occurs when executive level management uses MIS to extract decision quality data from the corporate data base. The data base already holds consolidated data.



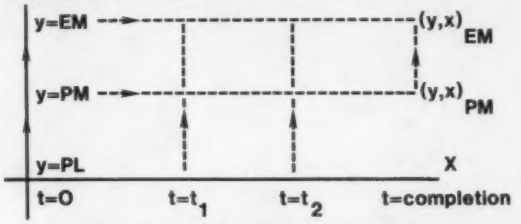
Management

Combination of the above major concepts provides a solid base structure for management of corporate decision information.

Executive management defines and controls the management information system. Electronic data processing managers define and control the data processing and hard output product systems. The project manager has no need to run either area and usually does not have the expertise. The project manager is the manager with visibiliy of the whole system and has a vested interest in making the project information system as effective as possible and must set the base for resource requests from executive management.

Project Information Management Technique

Project information is generated automatically and continually throughout a project's life cycle. A project's life cycle is conceptualized as a horizontal x-axis process starting at time t = 0 and ending at some planned future time t = completion. Project information flows vertically from the bottom of an organization to the top executive management. Bottom to top information flow is conceptualized as a y-axis function starting at the known project parameter level (PL). The top of the y-axis is executive management's information requirements (EM). The path of required information is through project management (PM).



Project Information Generation Process

For example at $t = t_1 y = PL$ information is generated by the project management system (CPM, PERT, other). The information is developed and manipulated into usable form between project level and executive management level. At time = t_2 the identical process takes place providing executive level additional new information. The (y,x) coordinate is a continual accumulation of all information purged to the desires of project and executive level management.

Goal

The goal of the information management process is to provide an uncluttered useful information output at all levels of management. The output should be continual and cumulative. The end result should be completion of a project management activity. The management information system output goal is developing and managing operating systems (project management); and designing information systems for decision making. Decision making is the only reason for managing project information.

Information System Structure

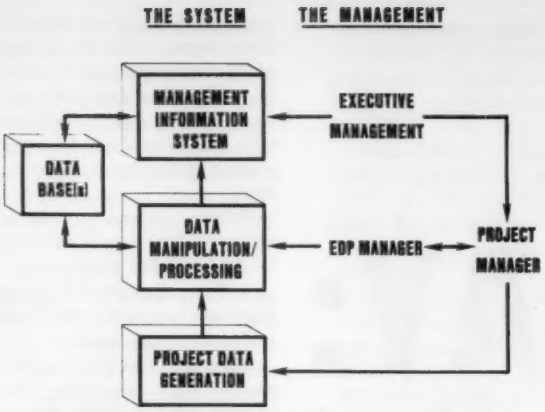
There are four components required to achieve the above stated goal:

- Project management system
- Data processing (continual life cycle control)
- Data base/bank
- Management information system.

There are three management entities in control of the information system and relying on it:

- The corporate decision makers — the level at which all projects are analyzed equally, resources allocated, and the level where corporate responsibility is seated
- The project manager — the person entrusted by the corporation to manage a project to completion profitably in an alloted time
- The electronic data processing management — the experts in reducing raw data to decision quality output.

A more detailed representation is appended.



Interrelating Managers and the Information System

Project Management as a Data Generator

Project management is accomplished through well-known systems such as PERT, CPM, GANTT CHARTING, or other systems. An essential element of each is an activity requiring accomplishment. A string of activities forms a management system.

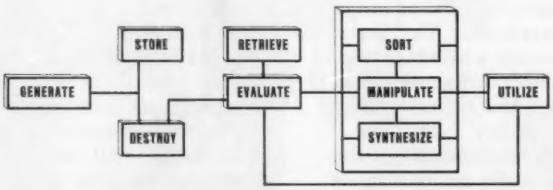
Each activity is characterized by elements of data such as time, cost, manpower, materials, delivery dates, etc. Each item is a data element available for electronic data processing. Data is continually generated (or extracted from) by a project's management system throughout its life cycle.

The data can oe generated:

- By activity
- Periodically on a predetermined schedule, i.e. weekly, monthly (called real time data generation)
- Instantaneously upon request, i.e. a one-time look at project status

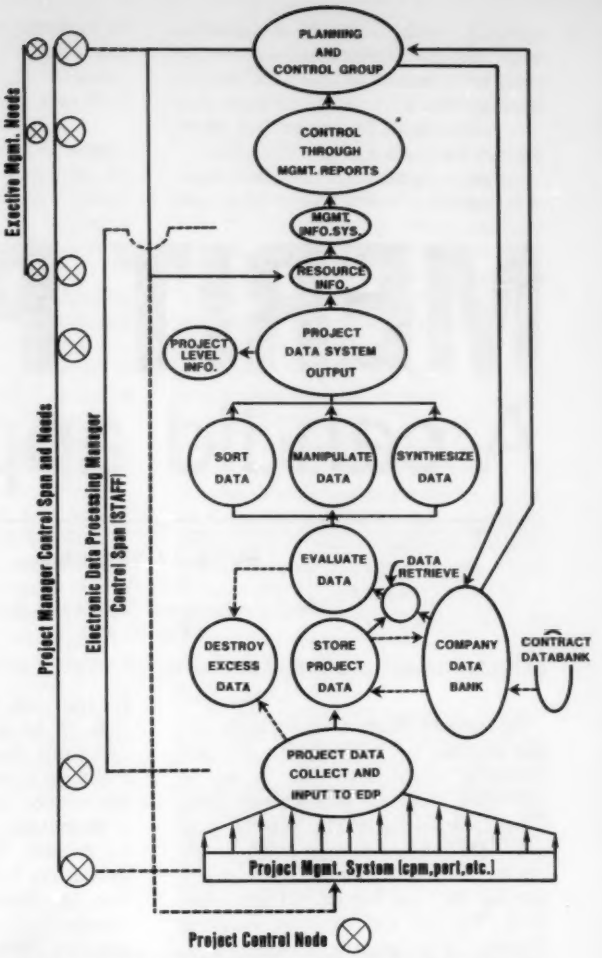
Data Life Cycle

Data lives and dies according to a set pattern. The data is either disposed of or forwarded for further use. Further use can be storage for future use or a direct output to the project manager. Storage is sent to a central or localized data base. Data can be forwarded for evaluation and conversion to decision form or again disposed of as excess to needs.



Data processing time is critical. Excess data should be disposed of as soon as possible. Hardware, software, and personnel are too costly to waste on useless data.

Management of project information should receive equal emphasis with all other project activities. Information management requires resource management, delegation of responsibility, flexibility, timeliness, and quality control. The project information supervisor should be chosen carefully with the same diligence as the safety supervisor or other key management staff positions.



Project Data Life Cycle Control Planning Technique

The project manager is not an EDP expert and should not micromanage the information system. The EDP manager is an expert in the field. Project management's concern is timely, accurate, decision quality output and quality input to achieve the output.

The project manager's prime function is to combine executive management output needs with his or her own as a basis for properly utilizing the EDP manager's full capabilities.

The project manager should endeavor to plan informational project control at the same time as project planning with integral care, and should also plan maintenance and review of the information process as a set part of his duties.

Project Information cycle control/planning techniques will eliminate corporate confusion and waste if implemented properly. Implementation is time consuming but the maintenance investment by the project manager is small. The benefit will be evident throughout the project cycle. □

MERIT PAY: A candid appraisal

By Paul J. Yaroschak
P.E., Va.
Head, Environmental Engineering Branch
NAVFAC HQ

• Alexandria, Va.

Pay for performance; an admirable goal and certainly not a new idea. An early American farmer stated that "It may be the willing horse that gets the most load, but once in awhile he also gets the most oats." Obviously a believer in this simple axiom, President Jimmy Carter signed into law the Civil Service Reform Act of 1978. The Act was the most sweeping overhaul of government personnel policies since 1883 when the "spoils" system was replaced by the merit system.

The Act's most important elements are: (a) creation of a Senior Executive Service of top level managers who forego some job security for the chance to compete for bonuses, (b) streamlining procedures for firing employees, and (c) covering all mid-level supervisors and managers in a merit pay system. In his 1978 State of the Union address, President Carter said " . . . this reorganization plan will restore the merit principle to a system which has grown into a bureaucratic maze."

Can the concept of merit pay work effectively in the government, where job security is high and no profit motive exists? This question will be answered in the context of my experience in implementing a merit pay system in a large engineering organization. The bottom line answer is yes, but with some qualifications.

Merit pay is really just the ultimate conclusion of an effective appraisal process. It's important, therefore, to briefly discuss some of the most common methods of appraising performance. There are really only two major types of performance appraisal methods: comparative and non-comparative. The practical differences between the two are vast. Non-comparative methods consider the performance of an individual with little or no reference to the performance of others. The individual's performance is evaluated on the basis of job standards, negotiated expectations or stipulated goals.

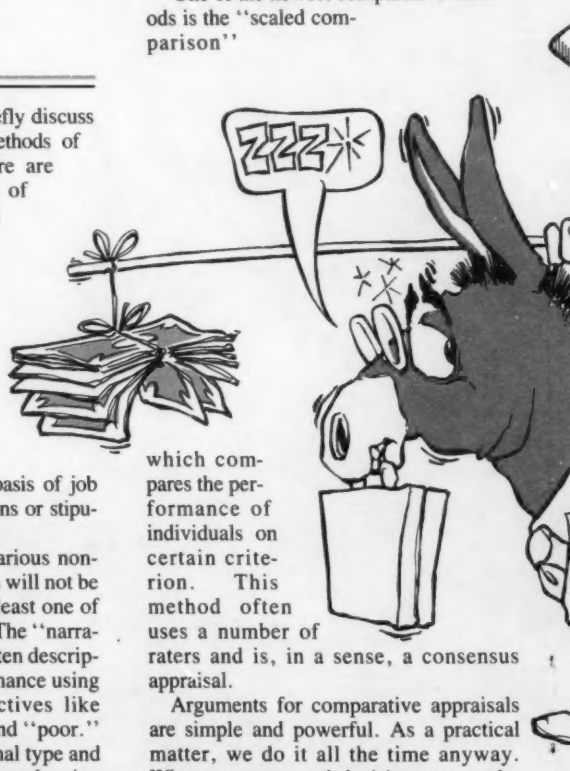
The pros and cons of the various non-comparative appraisal methods will not be discussed. Most have used at least one of these at some time or another. The "narrative appraisal" provides a written description of the individual's performance using specific incidents and adjectives like "excellent," "exemplary," and "poor." Rating scales, both the traditonal type and the newer "behaviorally anchored rating scales," are by far the most widely used. Performance is rated on a graphic scale with adjectives such as "outstanding," "above average," and "unsatisfactory" used to measure performance.

How many have seen all members of a branch or division get ratings in the outstanding or above average category? Some organizations try to control the lack of reliability inherent in this method by imposing allowable percentages for the number of ratings in each category. This cure can sometimes be worse than the disease by making the system entirely too rigid.

Finally, and most recently, "Management by Objectives" (MBO) has been used to appraise performance. However, as J. Peter Graves of Strategic Decision Data, Inc. contends, MBO simply is *not* performance appraisal.

There are also a number of comparative methods for appraising performance. "Comparative ranking" is a widely used method in which individuals in a given job category are ranked from highest to lowest based on performance. "Paired comparisons" is another version which matches every individual against every other in the group.

One of the newest comparative methods is the "scaled comparison" which compares the performance of individuals on certain criterion. This method often uses a number of raters and is, in a sense, a consensus appraisal.



Arguments for comparative appraisals are simple and powerful. As a practical matter, we do it all the time anyway. Whenever personnel decisions are made, we compare and rank individuals. We promote people not because they achieved their objectives, but because they achieved their objectives better than others. With limited funds available, it is often necessary to award only top per-

formers, no matter how good the performance of others.

Some people claim that comparative systems destroy teamwork and self-esteem. Yet, if the formal appraisal system fails to supply comparative data, managers will use informal methods to make personnel decisions. This can be good or bad, for it gives managers great flexibility, but can also propagate the "good ole boy network."

With this framework in mind, consider this description of the Navy's merit pay system and my attempt to label it. In early 1980, the Navy began training all its managers and supervisors to implement a merit pay system. The system consists of three basic parts: developing and getting commitment to objectives; appraising performance; and giving pay increases and cash awards based on performance. The simple mechanics are described. Each organization is divided into a number of Merit Pay Units, each with a merit pay "pool." Merit Pay Units are created so as to group similar types of work and ensure sufficient personnel to "contribute" to the pool. The merit pay pool is created by taking one-half of members' cost-of-living increases, plus their full longevity or "step" increases.

Thus, there is a fixed pool of money from which to fund pay increases. In effect, we all "ante-up" as in a poker game. Just as in poker, we are playing a "zero-sum" game. There will be winners and losers.

The Navy's merit pay system uses an MBO philosophy. Based on expressed organizational objectives, each merit pay system member, together with his or her supervisor, develops from five to seven specific individual objectives for the year. For each objective, a pair of performance standards are established. These standards describe exactly what, when or how a delivered performance will be "on target" or "above target." It is this attempt to predetermine expected versus more-than-expected performance levels that is one of the biggest flaws in the system.

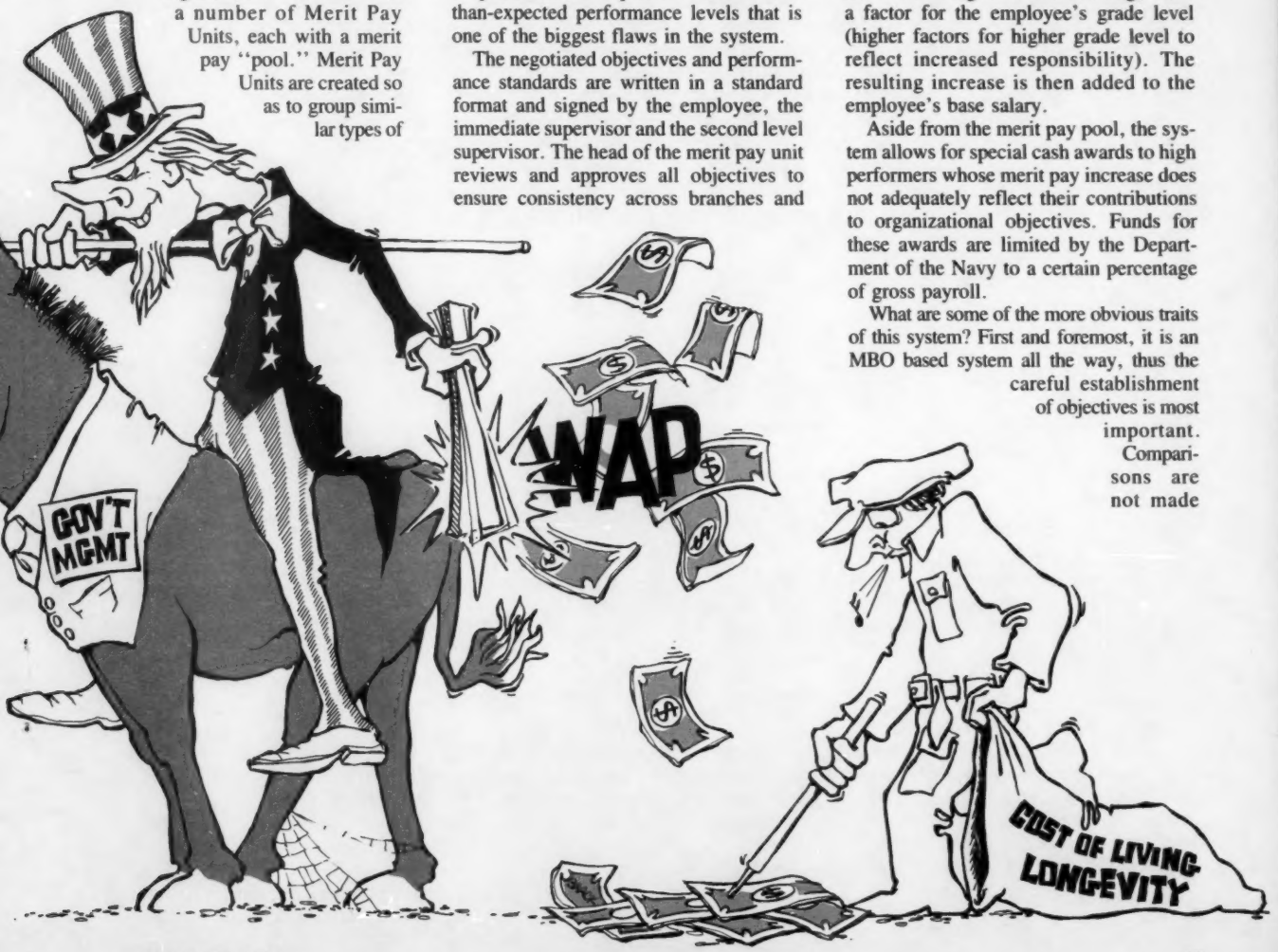
The negotiated objectives and performance standards are written in a standard format and signed by the employee, the immediate supervisor and the second level supervisor. The head of the merit pay unit reviews and approves all objectives to ensure consistency across branches and divisions. As the year passes, progress reviews between employee and supervisor are held quarterly. At the end of the year, each employee performs a self-appraisal on the performance of the objectives.

This appraisal is then discussed with the supervisor, who must assign a performance rating to each objective and then provide an overall rating. There are four possible ratings for each objective, ranging from "substantially above target" to "below target." There are five overall or summary ratings ranging from "outstanding" to "unsatisfactory."

After the head of the merit pay unit reviews and approves all ratings, it's time for the pay adjustments. The calculations are too complicated to explain fully here, but it works as follows: a "point" is defined as having a certan dollar value. An employee's increase is determined by multiplying a "point" dollar value times a factor reflecting their overall rating, times a factor for the employee's grade level (higher factors for higher grade level to reflect increased responsibility). The resulting increase is then added to the employee's base salary.

Aside from the merit pay pool, the system allows for special cash awards to high performers whose merit pay increase does not adequately reflect their contributions to organizational objectives. Funds for these awards are limited by the Department of the Navy to a certain percentage of gross payroll.

What are some of the more obvious traits of this system? First and foremost, it is an MBO based system all the way, thus the careful establishment of objectives is most important. Comparisons are not made



with respect to performance. Ratings are based solely on the accomplishment of individual objectives. This is strictly a *non-comparative appraisal* method. As J. Peter Graves contends, it is not really an appraisal system at all, since all it "appraises" is whether the objectives were completed as described in the performance standards. Compounding the problem, a comparative method is used to calculate merit pay increases. Remember, we all "anted-up" to form the merit pay pool. We are competing for a slice of the pie. In order to differentiate among the competitors, we must compare performance. If not, the merit pay increases are diluted to the point where top performers are not justly compensated.

In other words, a majority of the people achieve "above target." To compensate for this, cash awards from a separate account are used to reward top performers. And how are top performers determined? To date, this process has been clandestine, but it suffices to say that the merit pay unit official makes a *comparative judgment*.

This leads to the first recommendation for making the sytem more effective and real world oriented: *Eliminate the distinction between "on target" and "above target" performance standards*.

Experience with my objectives and discussions with many others has shown that this is a ludicrous exercise. Why? Becasuse the people we are talking about are all in relatively high pay grades. If we are honest, our objectives and "on-target" performance standards should reflect the fact that we are expected to do a good job. Anything beyond that is really a measure of how we did the job, comparatively speaking.

Merit pay is really just the ultimate conclusion of an effective appraisal process.

The merit pay system rules state that an "above-target" performance standard must be both achievable and measurable. In reality, the "above-target" level is just a measure of expected performance above the minimum "on-target." It is ridiculous to try to predetermine a performance level that is more than expected or "above target." It is enough of a problem trying to appraise difficult objectives almost achieved compared to overachievement of simple objectives. We should *establish one set of standards of expected performance* consistent with the position description and salary level for that job. You either meet them or you don't. Those who do draw equal merit pay increases from the pool. This is more consistent with the non-comparative nature of MBO.

We must also account for differences in responsibilities in different grade levels. We can do this, and at the same time take care of another major problem: in the current system, supervisors and their subordinates directly compete for salary increases from that same pool. No matter how careful the system is administered, this is a built-in mechansism for conflicts and hard feelings. It is obvious that in the end we all compete for the same money, but *the pools should be divided by grade levels* to avoid such direct competition. This may require some creative ways to form or divide merit pay pools, but the effort will be well worth it.

What about the top performers? How do we account for them? The current system of providing cash awards is fine, with two additions. *Use a comparative appraisal method for determining cash awards and provide a feedback system*. This can be done as follows: Any employee appraised in the top 20% (or 10% if you desire) of each grade level for each merit pay unit can receive a cash award. Employees in the same grade level would receive the same cash award. Provisions can be made for higher awards for exceptional accomplishments. Employees will be appraised and *comparatively rated* on overall performance in addition to their non-comparative objectives review, thus providing instant feedback. The following scale is a simplified version of such a method:

Upper 50% □
Lower 50% □ (must choose one)

Top 20% □
Bottom 20% □ (may also choose one)

Branch □ Division □ Pay Unit □

All employees must be rated in either the upper 50% or lower 50%. It would be permissible to rate more than half of the employees in the upper 50% to avoid the problem of being statistically required to rate a good employee in the lower 50%. It would, however, afford the opportunity to rate below average performers in the lower 50%.

The supervisor would also have the option to highlight top performers and any poor performers.

For employees to be motivated, they must receive valued rewards. Most organizations have systems for such things.

Finally, the *reporting period must be changed* to coincide with the fiscal year. Most of our important objectives are tied to the fiscal year. Our NAVFAC Command Management Plan, the heart of our MBO process, is specifically geared to developing and reporting on "goals" per fiscal year. It does not make sense to have the two processes out of sync. We can avoid the problem of heavy year end workload by starting the appraisal process after the fiscal year ends.

We currently "appraise" objectives in June, before the actual close of the reporting period on June 30. This is well suited to the folks who manage our pay system, since both merit pay increases and cost of living adjustments can be made at the same time. With new automated pay systems, however, different dates for these two pay adjustments should be a minor concern. We now adjust salaries for "step" increases on any of 26 differnet pay periods. Aligning the fiscal year and merit pay process will make objectives development easier and more meaningful.

Will this modified system motivate employees better than before? Not to any great degree. It will, however, *greatly reduce the dissatisfaction* with the current system. Based on 10 years of first-level supervisory experience, I agree to a large extent with Abraham Maslow. The lower level needs of the American worker have largely been satisfied, especially in the professional occupations. Most of our professional workers live fairly comfortably.

For employees to be motivated, they must receive valued rewards. Most organizations have systems for rewarding lower-level needs rather than such valued needs as peer recognition and sense of accomplishment. Therefore, it is usually up to the skills of the individual supervisor to reward these higher-level needs.

Philip C. Grant, Professor of Management at Husson College, identifies a number of factors which make it more difficult to motivate employees today.

There is a greater instability and diversity of values. Career aspirations, social relations, hobbies, and jobs change at a rapid pace. There are more guaranteed rewards than ever before. Collective bargaining has brought wage and fringe benefit packages unrelated to performance. The minimum wage and unemployment compensation protects the lower end of the scale. The work ethic, closely tied to religious beliefs, has diminished.

There is a reduced cost of failure in society. Progressive divorce laws, bankruptcy laws, and welfare programs have lessened the impact of failure. There is also more shared responsibility. In large organizations such as NAVFAC, there are lots of people responsible for projects, but few are held accountable. Loyalty to organizations has declined. Employees have shifted allegiances to unions, professional organizations, and outside interests. And finally, as I mentioned earlier, rewards must have a high value to motivate. With a relatively high standard of living and progressive taxation, any additional income is sometimes perceived as not worth the extra effort.

What can we do as engineering managers to mitigate these "de-motivators"? The need for peer recognition can be partly fulfilled by having engineers make formal presentations to their peers on the results of their work. Active participation in professional organizations and technical committees, related directly to job responsibilities, can also help.

A sense of accomplishment can be promoted by structuring job responsibilities such that engineers see a beginning and an end to their work. This is often difficult in compartmentalized organizations where planning, design, and construction are separated. One positive step in the right direction is the "team concept" in which members from each division follow a project from inception to completion and then conduct a post-occupancy evaluation.

This ensures that a full range of talents is brought to bear on a project, but individuals, not teams, are in decision-making positions. For individuals to be highly motivated they need to feel a personal sense of responsibility *and* accountability. Finally, and most importantly, we need to provide clear, immediate feedback to our employees on a day-to-day basis.

In summary, a merit pay system can work in a government engineering organization. It should contain both comparative and non-comparative elements. The non-comparative element should be an effective MBO based system of objective setting and periodic progress reviews. Cost of living and longevity increases can be tied to accomplishment of objectives. The comparative element should be a candid appraisal process with awards for top performers in each separate pay grade. This would eliminate direct competition between supervisors and subordinates.

The system must be consistent, therefore supervisors must be well trained. And finally, it must provide reliable feedback to employees. *Merit pay can be an effective way of rewarding employees* for a job well done. If properly administered, it can eliminate most of the dissatisfaction with such systems. *I doubt that it will ever serve as a major motivator* for employee performance. As Victor Borge so eloquently stated, "When a hand comes and wipes a tear away, that's my real reward; the rest goes to the government." □

reader's comments/questions

departments

Complimentary feedback — an editor's dream . . .

ATTABOY for your Winter 1983 issue. It is one of the best I've seen — addressing many topics of interest to people in the "field." Keep up the good work.

Sincerely,
CAPT J. J. Gallen, CEC, USN
Public Works Officer
Naval Submarine Base
New London
Groton, Conn.

Your letter is going into a frame and will be exhibited on my office wall. Thank you for writing and for your nice words. And just to prove that we don't print only the nice ones, read the following letter in which we get our fingers slapped by a very nice professional.

You've bungled it this time editor!

The lead paragraph of "Women in the CEC" (p. 2, *The Navy Civil Engineer,* Spring 1983) incorrectly referred to LCDR Jeri M. Rigoulot as the "first woman to join (the Corps)." LCDR Rigoulot was the *first woman graduate of the U.S. Naval Academy* to join the Corps. The pioneer woman to be commissioned in the Civil Engineer Corps in 1943 was ENS *Kathleen Lux,* a sanitary engineer from Logansport, Indiana.

The second to be commissioned was Gertrude E. Sawyer, a landscape architect from Washington, D.C. Sawyer was originally commissioned a LTJG in the WAVES but was transferred as a LT to the CEC in 1944 and commissioned a LCDR, CEC-USNR in 1951.

Incidentally, LCDR Helen R. Fairbanks, longtime and authoritative historian of the Bureau of Yards and Docks was *not* a memeber of the CEC but of the *USNR* or line reserve. These well-documented facts should end puzzlement to many members of the Corps dating from early WWII days.

Harold Welsh
Former editor (ret)
Navy Civil Engineer

I stand corrected.
I am so ashamed.
Thank you. I needed that!

'They are going to have to kick me

out!'

By JO1 STACEY J. HUESMANN

• Alexandria, Va.

He enlisted in the Navy to avoid being drafted into the Army, had no intentions of doing any more "time" than necessary, but discovered he liked the Navy and the Civil Engineer Corps so well, "they are going to have to kick me out."

LCDR Ernest R. Hunter, CEC, USN, the son of Peter and Lula Hunter, of Bryan, Texas, is the third youngest of seven sisters and four brothers, and is the only one of his family to go to college.

"I have always been very comfortable with math and science," Hunter said. "They were my best subjects in high school: It was natural that I went into one of the engineering fields, but I did not have any prior exposure to engineering before going to college."

Hunter was graduated from Texas A & M University, College Station, Texas, with a Bachelor of Science Degree in Electrical Engineering, in December 1972. After graduation he had a very good reason for joining the Navy; he was being drafted into the Army.

"I was part of the last group of draftees," Hunter said. "I was drafted soon after beginning my last semester at college.

"Because I was going through school on a co-op program (going to school for a semester and then working a semester), my college deferment expired before I got my degree. After writing my draft board and explaining the situation, I was able to get my draft deferred again, this time until several days after my scheduled graduation.

"In the meantime, I was corresponding with Union Oil in California. I had been working for Union Oil for two summers prior to graduation, and was being hired to work full-time for the company after graduation. The people at Union Oil suggested that I try one of the reserve programs. They wanted to make sure I had at least six months of full-time employment before going into the service."

Hunter has a brother in the Navy, Master Chief Mess Management Specialist (MSCM) Peter L. Hunter, who is the manager of the Commissary Store at NAS Corpus Christi, Texas.

"He is the oldest of my brothers," Hunter said, "and he has 28 years in the Navy.

"Even though Pete had been in the Navy for a number of years before I enlisted, I really didn't know that much, if anything, about the Navy. I never really

saw much of my brother, he was always on a ship, on the West Coast or East Coast, and he only came home occasionally for Christmas or between duty assignments.

"Because he was so much older than I was, we never really talked about the Navy. As far as I was concerned, he was just a guy who had a super life."

Hunter says that his brother, Pete, did not have any influence on his decision to enlist in the Navy.

"I finally ended up in the Navy, vice one of the other services," he said, "because after working all that time on my engineering degree, the Navy appeared to be the service that offered the greatest opportunity for me to work in engineering. It seemed to me that the Navy was the most technically-oriented organization at that time. I didn't really know, and it was just a matter of chance.

"My intentions at the time, were to come into the Navy, do my required time, and then go back to work for Union Oil. I discovered the Navy had a delayed-entry enlisted program; I could enlist, but not actually report for active duty until six months later.

"This was exactly what I wanted. I could spend six months working for Union Oil after graduation, establish my full-time employment, and then do my service time."

Hunter had no prior exposure to the Civil Engineer Corps. "I went to boot camp as an enlisted person, trying to get into one of the ratings that had some relationship to my engineering experience. I was an electrical engineer, so the electrician's mate (EM) rating seemed to make sense.

"I was about three weeks into boot camp when I first heard about the Civil Engineer Corps.

"Because I had a college degree, I was told to report to the officer accession office. There was a yeoman or personnelman working there, whose job it was to screen the records of the people going through boot camp. He was very adamant about people with degrees applying for the officer programs. He talked with me about my background. Even though his primary function was to interest personnel in the nuclear power program and the other line programs, he did tell me about the Civil Engineer Corps. He also gave me some literature to read about the Corps.

"I read the literature, and at the same time was thinking about getting married. I was a little worried about getting rusty in my engineering skills while I was doing my service time, and that's when I decided to apply for OCS.

"On my application, I had to list three program choices I was interested in; nuclear power, aviation, and the Civil Engineer Corps. I would rather have listed the Civil Engineer Corps as my first choice, but the needs of the Navy came first. They were more interested in people for nuclear power."

Hunter applied for OCS while in boot camp. He went to EM "A" school, and was accepted for both the Nuclear Power program and the Aviation program. He refused both of them, and finally was accepted for OCS and the Civil Engineer Corps about half way

'I went to boot camp as an enlisted person and then discovered the CEC'

through "A" school. He still had to wait, however, for an OCS class convening date.

After graduating from EM "A" school, number one in his class, he was meritoriously promoted to Electrician's Mate Third Class and sent to his first duty station, Coastal River Squadron Two, Little Creek, Va. Hunter reported to OCS in February 1974, almost a year after enlisting.

Commissioned an Ensign in the Civil Engineer Corps in June 1974, Hunter was graduated for OCS with honors, in the top five percent of his class. He continued his excellent scholastic record at the Naval School, Civil Engineer Corps Officers (CECOS), where he was also graduated with honors.

"My first job as a CEC officer was at the Naval Weapons Support Center (NWSC), Crane, Ind.," Hunter said. "I started out as a Project Officer, became Shop Engineer, and on several occasions also acted as the Assistant Public Works Officer.

"NWSC has one of the largest public works departments in the Navy. It is almost as large as a public works center. NWSC has a great number of tenant activities on station and there are a number of minor commands that are not actually part of NWSC. The NWSC public works department acts like a PWC for those tenant commands.

"Before I got to Crane, there was no central point of contact for the tenant activities to deal with. I set

LTJG Hunter (left) discusses plans with a shop supervisor during the reconfiguration of a bomb production line at the Naval Weapons Support Center, Crane, Ind.

myself up as a 'public works liaison officer', held meetings with tenant activity representatives and assisted them during the execution of special projects."

Hunter was at NWSC for two years, and was then assigned as the Public Works Officer of the Naval Security Group Activity, Skaggs Island, Calif.

"I was a lieutenant (junior grade) at this particular point in my career," he said. "My electrical engineering background came in very handy at Skaggs Island, because that activity dealt mainly with communications and electronic components."

Hunter was promoted to lieutenant (LT) during the two years he was at Skaggs Island, and then returned to Texas A & M University to earn his Masters Degree in Elecrical Engineering. He was graduated with honors, 4.0 on a 4.0 scale, and obtained his EIT certificate at the same time.

His next duty assignment was with a Seabee battalion, NMCB 133, homeported in Gulfport, Miss.

"I arrived at Gulfport just a few weeks before the battalion deployed to Diego Garcia," he said. "However, although the rest of the battalion went to Diego Garcia, I was in charge of a small detachment sent to the Philippines to work at Clark Air Force Base.

"I was the CBPAC Detachment Representative there. My job was to supply logistic and personnel support for people and material going to Diego Garcia. Almost everything that was going to Diego, including supplies, equipment, and personnel, stopped at Clark before going on. My detachment was responsible for keeping in contact with the battalion in Diego to insure they were getting the equipment they needed, when they needed it, and that they didn't get too much or too little.

"When I took over the job at Clark, there was a very limited air supply going to Diego, just two flights a week. There was always more material to be sent than there was air space to send it in. We knew what was needed in Diego and told the Air Force personnel what to put on the aircraft. We made up the flight load plans."

The job at Clark got interesting very quickly, Hunter said. Shortly after he and his Seabees arrived, the American Embassy personnel were taken hostage in Iran, and the Iranian crisis evolved.

"Within two weeks of our arrival," he said, "we went from two flights a week to two or more flights a day, sometimes there were as many as four flights. And instead of the C-14ls that had been used to transport cargo, we were sending cargo on C-5s (material was being flown from CONUS via Clark to

Hunter is frocked to LCDR. Assisting him with the shoulder boards of his new rank are CAPT You and Hunter's Wife Brenda. MSCM Pete Hunter, LCDR Hunter's brother, stood by to lend assistance.

Diego Garcia, off-loaded and then heloed to the ships that were on station in the Indian Ocean).

"There were so many flights going to Diego Garcia, we had to develop a better plan to let the Air Force know what was needed on those planes. In the past, load requests had always been verbal, but with the large volume of material now being shipped, we had to develop a load planning form.

"Initially, there were no supply personnel assigned at Clark specifically to support fleet operations in the Indian Ocean. Because the Seabees unofficially managed the Clark-to-Diego air operation, my people had to pick up on the fleet support, in addition to what was being sent to Diego for our construction troops.

"We were very much involved in keeping the logistic pipeline open for the fleet. Even after the Navy sent in Supply Corps personnel to start doing for the fleet what we were doing for the Seabees, the Seabees still kept control of the airlift. We wanted to ensure the construction being completed on Diego Garcia was not overwhelmed by the tempo of the fleet operations.

"Instead of spending just a few months at Clark, which had been the original plan, I ended up spending that entire first deployment there."

Hunter returned with NMCB-133 to Gulfport at the end of the battalion Diego Garcia deployment. He deployed once more with NMCB-133, this time to Guam.

"I was Bravo Company Commander during the deployment to Guam," Hunter said. "My company was in charge of camp maintenance and utility construction.

"We had one major project there, rewiring the Naval Weapons Magazine. That particular project had the highest priority and was one of the toughest projects I ever worked on. It was highly technical and involved a great deal of underground work and buried cables. NMCB-133 actually put the project on line after several battalions before us had done the initial work."

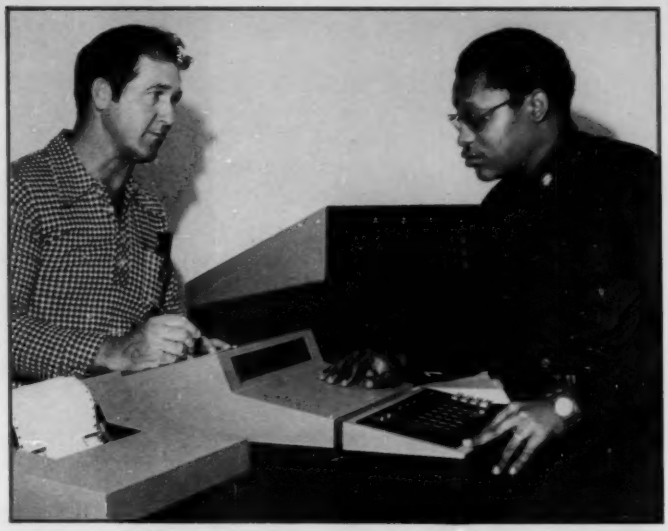
Hunter reported to his present job in Washington, D.C., as Rating Assignment Officer for the Seabee community in November 1981. It is his job to oversee the assignments of duty stations for the Navy's enlisted Construction Force worldwide.

"I supervise Seabee detailers," Hunter says. "There is a lot more to the job than just writing orders. We have to be concerned about personal situations, human being-type problems.

"We also control all of the Seabee school quotas. We are responsible for the assignments of Seabees for "A" school through termination of their enlisted service or retirement.

"My respect for detailers has gone up 100 percent, and not just because I am in the same business. There are a great many factors that have to be considered when writing a set of orders: family situations, family locations, the cost of living for a particular area, and personal or medical problems."

Hunter is now a frocked lieutenant commander with 10 years of Naval service. But he has no regrets about staying in the Civil Engineer Corps instead of returning to Union Oil when his initial military commitment was complete.



LTJG Hunter (right) talks with a member of NWSC Utilities Division during an energy monitoring system acceptance evaluation.

"It didn't take me very long to decide I wanted to remain in the Civil Engineer Corps," he said. "I was about 18 months into my tour at Crane, Ind., and that job put me into the people-business. I have grown to be more partial to that, rather than the hands-on, technical aspects of engineering.

"At this point I would be pretty hard pressed to go back to the drafting board and spend eight hours a day being a hands-on, nuts and bolts designer. I prefer to work with people."

LCDR Hunter is not only very career oriented, but is a family man as well. His wife, Brenda, a pre-school teacher, is also from Bryan, Texas, and they have a four-year-old son, Ernest, II. Together they take advantage of the great variety of sights to see in and around the Washington, D. C., area. They go to the exhibits at the Smithsonian museums, and enjoy amusement parks, such as Busch Gardens in Williamsburg, Va., and Kings Dominion, just north of Richmond, Va.

Hunter is glad that the word is starting to get out about the Civil Engineer Corps.

"I believe the Civil Engineer Corps is a golden opportunity for young engineers," he said, "but I fell into it strictly by accident.

"I could very well be doing something right now that would not be nearly as rewarding as the Civil Engineer Corps has been for me. I am not going to get rich being a CEC officer, but the job satisfaction is good.

"Looking back over my 10 years in the CEC, there have been some good times and some bad, but for me, at least, the good have outnumbered the bad. I intend to make a career of the CEC. They are going to have to kick me out!" □

news worth reviewing

departments

PWC San Diego, now operating dry dock facility

PWC San Diego became the "owner-operator" of the drydock at the Naval Station recently when the facility was officially turned over to the Center by the Supervisor of Shipbuilding, Conversion and Repair, San Diego.

Built during World War II, original construction of the drydock was completed in 1942 by the Bureau of Yards and Docks (now NAVFAC). The facility is 693 feet long, 104 feet wide and 42 feet deep, and holds about 20 million gallons of water, depending on the tide and whether or not a ship is in the dock.

PWC San Diego's recently acquired drydock facility at the San Diego Naval Station is located directly on the bay.

'Hush house' aids community relations

The Navy has found a way to become a better neighbor in civilian communities affected by the intense noise produced by jet engines during ground run-up operations.

It's called a "hush house."

The hush house is a 78′ by 72′ acoustical enclosure which accepts the total aircraft and reduces the 140-decibel sound level of jet engines in full afterburner to a loud but acceptable level immediately outside the enclosure. On a 250-foot radius around the structure, the noise level is down to 85 decibels which is conducive to normal conversation.

A great advantage of the hush house over open air operations is the fire extinguishing system installed in the deck and ceiling.

The Navy's hush house program is managed by the Naval Facilities Engineering Command. Exploratory research is performed by the Naval Civil Engineering Laboratory, Port Hueneme, Calif.

PWC, Guam, earns SECNAV Energy Award

The Secretary of the Navy named U.S. Navy Public Works Center, Guam (PWC Guam) as the winner of the SECNAV Energy Conservation Award for Fiscal Year 1982. PWC Guam took the honors in the category of Navy Operated Navy Industrial Activities.

The highly competitive award attests to PWC Guam's superior performance in meeting Navy-wide energy goals, energy conservation planning, and the efficient use and maintenance of energy consuming, producing and distribution equipment.

PWC Guam boasts a seven-year energy reduction of 16.70 percent in its industrial activities and a 20.23 percent energy savings in housing units, placing it well ahead of the energy reduction goal schedule set by the President in 1975.

According to Captain John L. Dettbarn, (former) commanding officer, PWC Guam's engineers also serve other federal activities on the island by conducting energy surveys, pinpointing where waste occurs and advising on ways to end it.

During Fiscal Year 1982, ten authorized ECIP projects drastically reduced energy consumption. Employee participation is a large part of the Energy Conservation Program. □

Navy shares research of unique craft

The Navy, the Army and the Marine Corps are participating in a joint project to develop a new military reconnaissance boat.

The Military Amphibious Reconnaissance System (MARS) is an inflatable craft that can carry a squad of seven men and their equipment. It can be pushed out of the hatch of a nuclear submarine or air dropped from a C-130 cargo plane or a helicopter. In operation, the boat can be inflated in less than a minute and completely assembled by its crew in less than half an hour.

What makes this craft unique, though, is its outboard motor. The 35-horsepower engine is completely submersible.

It is believed to be the only engine of its kind with this capability.

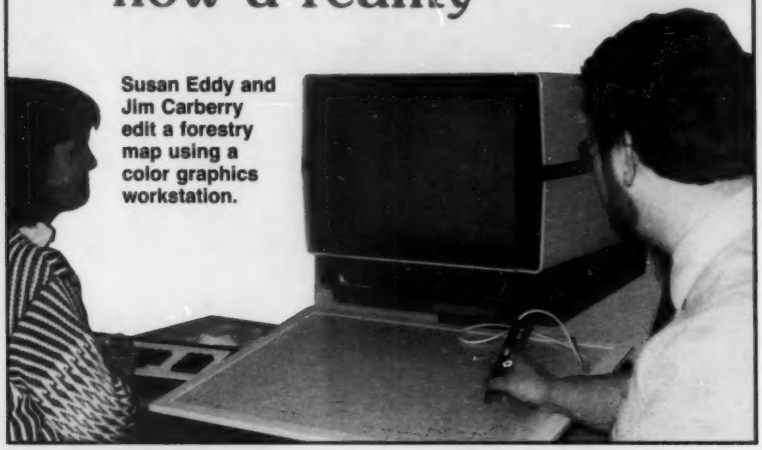
It took three years, but Brockman got a patent

Thomas H. Brockman, a civilian employee at CBC, Gulfport, Miss., submitted a beneficial suggestion in May 1980. It was processed and within a short time, Brockman received a cash award for the high savings his idea made at the Seabee Center.

Thomas H. Brockman received not only a patent for his money saving idea, but cash awards as well.

In March, 1983, the Department of the Navy Patent Counsel announced that Brockman's suggestion had made such a valuable contribution to the Government that a patent had been assigned to it. His suggestion entitled, "A Cable Testing System," relates to cable testing systems which test the safe working load without untwisting the lay.

Computer-aided mapping — now a reality



Susan Eddy and Jim Carberry edit a forestry map using a color graphics workstation.

By James. J. Carberry
Operations Research Analyst
Systems Analysis Division
NAVFACHQ

• Alexandria, Va.

Electronic pen in hand, a planner sits in front of a color graphics workstation. With a touch of the pen, the planner selects relevant categories of information in a digital model of a naval activity to be displayed on a video screen. "Drawing" with the pen on an electronic digitizing tablet, the planner adds the outlines of planned facilities to produce a custom graphic display for a capital improvement plan.

Nearby, a real estate specialist at a similar workstation types in the legal description of a Navy land parcel as a line map is automatically generated. With a few strokes of the electronic pen, the property lines are automatically annotated with bearings and distances. Finally, another touch of the electronic pen activates a pen plotter which rapidly produces a quality hard copy.

Scenes such as these will soon become common at NAVFAC's Engineering Field Divisions (EFDs) as Computer-Aided Mapping is implemented. Computer-Aided mapping is the Facilities Planning and Real Estate portion of the NAVFAC Graphics Design System.

The project involves installation of a mini-computer based interactive graphics systems to support planning and design analysis and graphics production. The project will increase productivity of NAVFAC personnel and the quality of NAVFAC products by using the speed, flexibility, and analytic capabilities of the computer.

The advantages of mini-computer based interactive graphics systems for planning are compelling. Within the EFD Planning and Real Estate Division, the Computer-Aided Mapping application will provide improved models of Naval bases for planners to work with, in producing Master Plans, Natural resource Management Plans, and Systems Studies.

Much planning requires either an activity map to use as a working model of an activity or the production of a custom graphics display to communicate a plan.

The increased productivity available with interactive computer graphics systems allows the same production to be performed in less time or more production in the same amount of time. This will result in increased responsiveness to our Navy customers.

Using a computer allows for a high degree of accuracy. Computer-Aided Mapping will allow NAVFAC to highlight and reconcile inconsistencies between Existing Conditions maps and Real Estate Summary Maps.

It will also allow using control points from the National Geodetic Survey and the National Ocean Survey to improve some of our maps which lack coordinate control.

A major advantage is the flexibility of Computer-Aided Mapping. This flexibility is manifested in several ways. Selective information level graphics and selective area graphics provide content flexibility.

Additionally, input and output can be performed at any scale ant the system can make intelligent changes to output related to the scale such as excluding features below a certain size when showing a small-scale map or systematically making coversions such as to the 1983 North American Datum or to the metric system.

The computer also provides the capability to synthesize information from many different sources, such as other NAVFAC systems or other government agencies, because the world is converting to digital technology. This includes the ability to add non-graphic information to the graphics to allow the user to locate and highlight features with a specified combination of characteristics.

As a simple example, a major feature of Computer-Aided Mapping that allows for flexibility is layering. Layering is similar to the use of transparency overlays but is much more powerful. It allows the user to easily produce a custom map by selecting only those layers with information relevant to the user's needs.

With the computer, there can be up to 255 of these layers, many more than the number of transparencies that you can stack up, each of which contains a distinct category of geographically distributed information.

In addition, while transparent overlays are two-dimensional sheets that stack up, Computer-Aided Mapping layers can be three-dimensional models that coexist in the same space.

A typical Computer-Aided Mapping installation will consist of a mini-computer, a magnetic disk drive for on-line storage, a magnetic tape drive for archival storage, a color workstation, a monochrome workstation with a large digitizing tablet for inputting maps, and a four-pen line plotter to produce ballpoint or wet ink plots on paper, vellum, or mylar.

The workstations each consist of a keyboard, a video display, an electronic pen, and a digitizing tablet.

The digitizing tablet is divided into two areas: an area mapped to the video display for specifying locations and a menu area for specifying commands.

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By digitizing a command square on the menu, a graphics command, series of commands, or an entire program may be activated — a process that avoids typing errors and speeds graphics production.

Hardware, software, maintenance, and training for the Graphics Design System are being procured under the auspices of the Computer-Aided Engineering Program, which is managed by the Computer-Aided Engineering Support Organization at Naval Weapons Center China Lake. A contract was awarded to Computervision Corporation to provide the systems and support.

The Computer-Aided Mapping objective is to produce all kinds of map displays — Existing Conditions Maps, Real Estate Summary maps, site approvals, Master plan displays, forestry maps, utilities maps — from a common data base.

Existing maps with known accuracy, and precision, such as those produced by photogrammetric aerial surveys, may be directly digitized. For bases where the maps are of unknown accuracy, a new aerial survey can be flown to obtain the map in digital form through the use of a digital stereoplotter by the photogrammetrist.

It is important that this data base be precise, accurate, and up-to-date. The system can easily maintain the maps once they are in digital form and will contribute significantly to Facilities Planning and Real Estate productivity. □

advice of counsel

departments

By WILLIAM H. SPECK
NAVFAC HQ

"The hungry judges soon the sentence sign/And wretches hang that jurymen may dine"
Alexander Pope

The legalization of procurement for A-E, construction, public utilities, and public works services proceeds at an accelerated pace. "Legalization" is a deliberately awkward word, chosen to suggest the clumsy process "to make legal." That process requires governance by laws and regulations with the opportunity for those dissatisfied to obtain determination of rights after due process before some tribunal.

Almost two hundred years ago Federal Procurement began under the protective veil of sovereign immunity — "the King can do no wrong." Contractors had no legal rights in procurement or on contracts and had to rely on the good faith of the executive officers or on private relief bills from Congress.

The frustration and opportunities for favoritism, pressures, and corruptions of this no-law situation led to establishment of the Court of Claims in 1855 (10 Stat. 612), and the grant of jurisdiction to that court in 1887 to render judgments against the United States upon Acts of Congress, regulations or "any express or implied contract with the United States" (24 Stat. 505, 28 U.S.C. 1491).

The legal right to sue so created had little procurement significance for almost a hundred years. The acts of Congress governing procurements numbered fewer than half a dozen, procurement regulations until the 1950's were scattered and encompassed in one moderate size volume, and these statutes and regulations were described as intended for the guidance of government officers and employees.

Courts usually held that private parties had no "standing" to sue upon procurement actions because denial of an order was not a legal harm and procurement requirements were not intended to confer private legal remedies. *Perkins v. Lukens Steel Co.*, 310 U.S. 113 (1940). The court relief was money judgment years after events.

But thirty years later *Scanwell Laboratories, Inc. v. Shaffer*, 424 F.2d 859 (D.C. Cir. 1970), held that the Administrative Procedures Act, 5 U.S.C. §701, granted disappointed offerors a right to sue to halt awards and performance of contracts.

A flood of litigation began. Most courts now will give relief for violations of procurement laws or arbitrary or capricious or unsupported actions under such laws. And procurement laws in statutes and regulations encompasses at least a book shelf of printed matter.

The flood of litigation to legalize became headlong with the Federal Court Improvements Act approved 2 April 1982. That Act intended to provide "complete relief" and prevent interference with contract performance by conferring "exclusive jurisdiction" on the Claims Court "to grant declaratory . . . and . . . equitable and extraordinary relief . . . including injunctive relief" "on any contract claim brought before contract award." 28 U.S.C. 1491(a)(3).

The Department of Justice promptly urged that jurisdiction lay only in the Claims Court (no longer in district courts) and only before award. And the new Court of Appeals of the Federal Circuit held that suit must be brought before contract award for such relief so that disappointed suppliers could not wait for administrative or GAO decision. *U.S. v. John C. Grimberg Co.*, 39 FCR 720 (23 March 1983).

The rush to court and to legalize becomes precipitate and unseemly, and judgments come first with deliberations later. Unless the lawyers representing procurement activities will stipulate not to make award, Claims Court judges come under great pressure to restrain awards for a couple of weeks just to get time to look into the merits of claims.

In a brief two weeks they compress pleadings, discovery of evidence, preliminary injunction hearings, and decision and thus give protester a day in court and a decision to legalize the procurement award. Lawyers, OICCs and contracting officers must learn to respond just as quickly. □

Incentive pay new at NWP San Diego

By A. J. KEHOE
Navy Public Works Center

• San Diego, Calif.

In early 1980, the Transportation Department at the Navy Public Works Center (PWC), San Diego, embarked on a program to improve productivity of automotive and heavy equipment repair mechanics in the maintenance of transportation equipment. The PWC San Diego provides maintenance support for approximately 3,500 pieces of equipment which includes the Civil Engineering Support Equipment (CESE) allowance assigned, customer equipment, and equipment assigned to ships home ported in San Diego.

A standard known as a factory flat rate is used to gauge the performance of a mechanic and can be found in repair manuals such as Motors, Chilton, and Mitchell's books. These books contain two flat rates, i.e., factory (the rate allowed by the factory for warranty work) and commercial (the rate charged customers off the street) — the difference being dealer profit. At PWC mechanics are held to the factory rate.

Past performance of personnel was reviewed and it was found that this standard has been exceeded on the average of 17%. A further review was made of commercial repair shops in the local area to determine methods of gauging performance and reimbursement of mechanics. This indicated mechanics in commercial shops were paid a percentage of the number of flat rate hours "booked" in an eight hour day.

Depending upon the speed, efficiency, and motivation of the individual mechanic, as many as 12 to 14 commercial flat-rate hours were being accomplished in an eight hour period.

With this information, transportation personnel proceeded to put together a program whereby federal civil service mechanics would share a portion of the savings realized by the command for all work produced in less time than allowed by flat rate. This was locally decided to be at the 30% level and would be based on the mechanics wages plus fringe benefits. The expected results were anticipated to be as follows:

- **Productivity.** Providing a method of measuring productivity against a standard applied to individual mechanics that has been accepted industry-wide.
- **Traumatic Injury.** A reduction in traumatic injury claims, particularly those that may border on fraudulence because in order to participate in the program the employee must be present on the job.
- **Attrition.** Providing an incentive based on productivity for younger workers to remain with federal government service.
- **Financial Savings.** A financial savings based on increased productivity that could be passed along to customers in the form of reduced rates.

It was believed that a precedence for the program was established at the Long Beach Naval Shipyard wherein an incentive program was designed by Naval Personnel Research and Development (NPRDC) to improve individual productivity of Navy civilian key-entry operators.

Based on this precedence, a request including a description of the proposed program was forwarded to the Chief of Naval Operations (CNO) via Commander, Naval Facilities Engineering Command (COMNAVFACENGCOM) in September of 1980.

In June of 1981, approval was granted contingent on the development of a system to provide adequate safeguards to ensure that the work was done accurately because the possibility existed that less time for completion of the job could result in a lowering of work quality.

The PWC immediately appointed an Implementation Committee comprised of the transportation department head, personnel officer, management office, comptroller, and a representative of the production officer to work out a system whereby quality would be assured, potential for fraudulance eliminated, provide timeliness of payment, determine side benefits to be monitored, and to determine the type of reports required. In this regard, the PWC Industrial Management Division (NAVFACENGCOM 151) provided invaluable assistance.

The program operates as follows:

- A service writer initiates a shop repair order (SRO) through inspection of the vehicle and applies the appropriate factory flat rate by individual task.
- If a flat rate does not exist the work is estimated and incentive pay is not paid until the same task is accomplished three times by three different mechanics. The average time then becomes the established "flat rate" and incentive pay is allowed for further occurrences.
- Shop repair orders are issued by the foreman to the mechanic deemed best capable of performing the tasks required to ensure the highest level of productivity. (In every shop there will be individuals who excel in transmission overhaul, tuneup, electrical repairs, etc.)
- Once the SRO is issued the mechanic immediately clocks "in" with a clerk who is centrally positioned in an office in the middle of the shop. At the completion of the job the foreman approves the work whereupon the mechanic clocks "out" with the same clerk. The elapsed time is annotated on the employees labor card along with the flat rate allowed for that particular job. At this juncture, the process is repeated for the next assignment.

At the end of each working day, all labor cards are submitted to data processing for inclusion in the various reports. The Production Management Division developed

the 105 system which is used to support the Incentive Pay Program. The 105 captures actual hours worked against the standards.

A product of this system is the 4117 Report which provides biweekly information that includes the employees social security number, work center, shop repair order number, standard hours (flat rate), actual hours, percent of completion (if the job is still in progress), and the number of hours eligible for incentive pay.

On the Wednesday preceding the end of a pay period, the management analyst, Transportation Department, computes the incentive pay earned by social security number on a document approved by the department head for submission to the comptroller. On payday, the individual receives his regular paycheck plus a separate check for incentive pay. Checks are only issued with values of $25 of more, lesser amounts are "banked" until the $25 threshold is reached.

To date, this program has provided some very gratifying results, such as, overall productivity improved approximately 23%, downtime of equipment reduced by 50%, manpower inputs well below the goal, time off for a traumatic injury dramatically reduced, and improvement in the overall morale of the employee.

An incentive pay program is not a panacea to solve all problems of productivity. This type program appeals primarily to the younger mechanic who is still faced with the responsibilities typical of the young person, i.e., mortgage payments, family education, and well-being, etc.

The older mechanic not faced with these problems may not be as well motivated, however, they do tend to get caught up in the enthusiasm and will perform at a better pace than previously noted.

It has been interesting to note that as a result of an article published about this program in January 1983, approximately 15 inquiries have been received from various non-DOD government agencies, states, and municipalities including the states of Michigan, Maryland, Georgia, as well as larger cities such as Indianapolis, Baltimore, Houston, to name a few.

There is obviously a recognized need for productivity enhancement in the private sector, and a keen interest in any program that will result in improvement. □

situation report

departments

DRYDOCK EVALUATION - The NAVFAC-04B Swat Squad evaluated the structural adequacy of Drydock #1 at Long Beach Naval Ship Yard. This eliminated the need for a $1.5 million wall reinforcement project. In addition a re-evaluation of sand drains and deep water wells resulted in savings of $700,000. Based on the above evaluation and a recent condition survey NAVFAC-C4B recommended to NAVSEA certification of the drydock to 79,320 long tons. Certification of the drydock will significantly affect fleet readiness.

(NAVFAC Code 04B)

AVIATION FACILITIES - An Ad hoc Committee for aviation engine test facilities has been established by CNM. Mr. E. Ference, 04T3, drafted the charter for this Committee which will deal with planning and technology problems in these facilities. It is anticipated that the Committee will consist of CNM (MAT-04H), CNO (OP51), and a CMC representative. The working group will include NAVFAC, NAVAIR, NAVLOGCEN, COMNAVAIRLANT, COMNAVAIRPAC, CNATRA, and CNAVRES.

(NAVFAC Code 04T)

An alternate method of heavy equipment estimating

By
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P.E., Wis.
Instructor, Public Works Management, CECOS
• Port Hueneme, Calif.

One of the most frustrating experiences as a ROICC/AROICC is to participate in a change order negotiation and be unable to reach a bilateral agreement. Far more serious than all the time and energy lost in preparing for the negotiation are the repercussions that follow. Strained contractor-government relations, contract delays, additional costs and change orders, and contractor claims are a few of the adverse results that seem to accompany unsettled change order negotiations.

It is widely accepted that it is in the best interest of all parties concerned to settle change orders at the lowest level of authority possible and in most cases as soon as possible. There are a multitude of factors in the change order process working against the Resident Officer in Charge of Construction/ Assistant Resident Officer in Charge of Construction (ROICC/AROICC) in trying to achieve these goals.

The change order work must be identified and defined, funds must be secured, estimates prepared, negotiations held, and a Notice to Proceed issued, all of which take varying amounts of time depending on the complexity of the individual change order.

Ultimately, either expressed or implied, it is the ROICC/AROICC that is given the responsibility to ensure that a fair and reasonable agreement is reached if at all possible. Therefore it's incumbent upon the ROICC/AROICC to utilize every available resource to determine what a fair and reasonable cost is and expedite the change order process.

It can be argued that one of the most important documents controlling the amount of time spent on processing a change order, the amount of money approved for the work, and eventually the overall project completion and customer satisfaction is the government estimate. All other factors equal, if the ROICC/AROICC is furnished an accurate government estimate that can be justified with supporting documentation substantial time can be saved at the negotiation table and the entire change order process.

The concern here is with improving the quality of one portion of the government estimate that historically causes the most problems. This is the area of heavy equipment estimating. There are three main reasons why government estimates have a tendency to differ more with respect to contractors' proposals in this area than others.

First, many contractors do not have an accurate method of evaluating the costs. Therefore, when a Request for Proposal is received a contractor will fill in the equipment cost based on intuition rather than actual cost data.

Second, there is no correct way of estimating equipment costs that can be used as a universal guide.

And thirdly, equipment costs are a function of outside variables such as site conditions, weather, safety regulations, and the age and capacity of the equipment itself. It is hard to predict what assumptions will be made by the contractor in evaluating all of these variables in preparing a proposal.

A logical approach would be to prepare an estimate that addresses all of the components that make up owned equipment costs. Flexibility should be built in to compensate for varying site conditions, weather conditions, age and capacity of the equipment, etc. With documentation to support these assumptions the ROICC/AROICC would be equipped with an estimate that would be fully compatible with the contractor's proposal.

A form is used with an estimating method that incorporates this technique. The form shown is a consolidation of estimating guides used by various suppliers, equipment companies, contractors, and government organizations. The form is divided into three main sections: Input Data, Ownership Expense, and Operating Expense.

The Input Data consists of type and model, original cost, horsepower, and age of equipment to be used. Each component of the ownership and operating expenses is then calculated based on the actual site conditions. It is essential therefore, that the data supplied by the estimator is based on the actual equipment that will be used. The final equipment costs estimate will then reflect a cost that has taken into account the actual site conditions as well as the performance characteristics of the actual equipment.

Obtaining this basic information is not viewed as a problem. Typically the equipment in question is on site performing other work. If not, the type of equipment to be used can be obtained from the contractor directly, when discussing the scope of work with him. Once the type of equipment is known the remainder of the information can be collected by calling the appropriate equipment dealer if the estimator does not have access to the various performance handbooks and cost guides.

Ownership cost is the amount of money that must be recovered through work to have the machine pay for itself. This cost is determined by the purchase price, depreciation period, cost of investment, insurance and taxes. At the time of purchase these values are set and will not change throughout the depreciable life of the equipment. For this reason these costs are commonly referred to as "fixed" costs. Ownership Expense consists of depreciation expense and interest expense as shown.

Operating costs are those that are consumed while the equipment is in operation. These costs will vary depending on the type of work, operating conditions, and the quality of the maintenance program and operator care that is given to the equipment. As a result of this, the operating costs are commonly referred to as the "variable" costs. These costs consist of fuel, repairs, tires, oil, grease and filters as shown on the form.

The ownership and operating costs are computed directly from the Input Data gathered by the estimator. Graphs and charts have been prepared which

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provide ranges of values to be used in calculating the individual component costs. In this manner the estimator can develop accurate estimates based on the actual parameters that pertain to the individual change order.

The advantages of this method are numerous. One of the most obvious advantages is that it is a "Quick Method" of estimating. With minimal background information and limited time an estimator can determine reasonable, supportable estimates for equipment. This is especially advantageous when the ROICC/AROICC must have a government estimate prepared immediately to eliminate further contract delays.

The method is self contained. With a minimal amount of background information, the ownership and operating costs can be estimated without the use of any other guides, publications or references. This will prove very beneficial to the office that does not have access to the various cost estimating guides. The method is flexible.

As with any estimate the better the input the better the output. If the estimator has a thorough understanding of the change order work and has additional information with respect to the operating conditions and the condition of the equipment, he can pick and choose the appropriate factors more closely.

Although this is designed for quick estimating it can also be used under any circumstance. If the estimator has sufficient time and has access to various records the same procedure can be used, but instead of utilizing the various graphs and charts the actual data from records or accounts could be used.

This estimating process yields reasonable and supportable results. This puts the burden of proof on the contractor. Every component can be discussed in detail. If the contractor cannot produce actual records supporting his proposal, or if it is found the government underestimated a particular cost each individual item can be changed accordingly.

And finally, this estimating procedure and the form that is used is understandable. Every step of the process is explained and easily comprehended. When the ROICC/AROICC sits down at the negotiation table he will have an estimate that consists of not just a lump sum figure but individual component costs that can be broken down to reach a final settlement.

Due to space limitations the detailed explanation of the actual "Quick Estimating Process" has been omitted here. (If there is further interest, contact the author.)

It is acknowledged that through the Armed Services Procurement manual (CASPR) equipment costs for government estimates are governed by the AGC manual (sixth edition).

The proposed quick estimating process can be used as a method of verifying the validity of the AGC values under a given set of conditions. The estimating technique is not a panacea for all the problems associated with negotiating change orders, however, it is an option that can be used to support the ROICC/AROICC's negotiating position.

Hopefully, it will reduce the number of unsettled change orders, the need for resorting to bottom-line negotiation, and the amount of time required to both prepare the estimate and negotiate the change. If these goals are met this estimating procedure will have served its purpose. □

HOURLY OWNING AND OPERATING ESTIMATE

Section I — Input Data
1. Base Machine _____
2. Attachments _____
_____
3. Tire Replacement Cost _____
4. Horsepower _____
5. Age _____
6. Original Purchase Price _____

Section II — Ownership Expense
1. Depreciation Expense
a) Salvage Value = (Original Purchase Price) x 10%
= _____
b) Original Tire Cost = (Tire Replacement Cost) x EAF
= _____ x _____ = _____
c) Net Deprec. Value = Original Purchase Price – (1a + 1b)
= _____
d) Deprec. Cost = Net Deprec. Value / Estimated Life (Hrs)
= _____ = _____

2. Interest Expense
a) Interest Cost = (Original Purchase Price) (% Interest) (2) (# of Operating Hours/Year)
= ( ) ( ) = _____
(2) ( )
b) Taxes and Insurance (If Applicable) _____

3. Total Ownership Expense = (1d + 2a) _____

Section III — Operating Expense
1. Fuel Expense
a) Fuel Consumption = (Fuel Consumption factor) x (Horsepower)
= _____
b) Fuel Expense = (Fuel Consumption) x (Unit Price of Fuel)
= (_____) x (_____) = _____

2. Filters, Oil and Grease (FOG) Expense
a) FOG Expense = (FOG Factor) x (Hourly Fuel Expense)
= (_____) x (_____) = _____

3. Repair Expense
a) Repair Expense = (Repair %) x (Purchase Price − Tire Cost) x EAF / Total # of Operating Hours
= ( ) x ( ) x ( ) = _____
( )

4. Tire Expense
a) Tire Expense = Tire Replacement Cost / Tire life (Hours)
= ( ) / ( ) = _____

5. Total Operating Expense = (1b + 2a + 3c + 4c) = _____
Total Hourly Ownership & Operating Expense (II-3 + III-5) = _____

Self-Illuminating Exit Signs = high payback

By LT JAMES F. McCOLLUM,
CEC, USN
P.E., Conn.

• Port Hueneme, Calif.

The Marine Corps Development and Education Center (MCDEC), Quantico, Va., submitted a project recently, to replace incandescent illumination exit signs with self-illuminating exit signs for a cost of $97,238. The first-year savings were anticipated to be about $37,171 with an anticipated payback time of 2.6 years — an excellent prospect. The contractor bid much lower, however, and the actual payback will be about 1.5 years!

What are the benefits of these self-illuminating exit signs? The Army has an excellent Technical Note (No. 81-10 dated 18 Sept 1981) which provides much of the information needed. The primary benefit is that virtually all operation and maintenance expense is eliminated for the life of the device; normally from 10 to 12 years. Power failures or other disturbances will not cause them to go out.

In new construction, expensive electrical circuits can be totally eliminated. In retrofits, the release of a dedicated circuit for other use may be of considerable benefit. Initial total cost of installing circuits and conventional devices approximately equals the cost of the self-illuminating signs. Installation labor and expense for the self-illuminating signs is about that of hanging a picture.

The amount of electricity saved varies and depends on whether your existing fixtures are flourescent (13 — 26 watts) or incandescent (50 — 100 watts). Multiply the number of fixtures × wattage/fixture × hours operated/day × days/year = KWH/year savings. For example assume:

400 incandescent fixtures

0.08 $/KWH 0.05 KW/fixture

24 hours/day

365 day/year operation

$400 \times 0.1 \times 365 = 350400$ KWH/year

$350400 \times 0.08 =$ $28,032/year for electricity

Now add in savings achieved from:

- Avoiding labor to change bulbs
- Avoiding bulb material, stocking and storage costs
- Avoiding transportation costs involved in bulb changes
- Reuse of existing bulbs

The above savings can be significant. For the MCDEC Quantico project estimates of bulb change interval and savings were 700 hours (29 days) and $13,512/year when all factors were considered.

The cost of a self-illuminating sign depends on whether one or two faces are illuminated primarily and varies between different suppliers. Single-face prices will likely be $100 to $150 while double-face prices may be $250 to $330. The contractor at Quantico found better prices than these ranges indicate. The labor cost should be about $10 per sign.

Here's how the signs work. A radioactive gas and phosphors are sealed in the unit when manufactured. The units remain continuously illuminated from time of manufacture and provide required levels of illumination from 10 to 12 years. Illumination degrades from about 0.13 foot lambert to 0.065 foot lambert over about a 12-year period; this is the half-life of the radioactive gas (usually tritium).

The application of radioactive gas has been approved by the Federal Nuclear Regulatory Commission and no harmful radiation is produced. Proper disposal is about the only safety or maintenance requirement of these devices. They must be returned to the manufacturer or to a suitable disposal facility for radioactive gases when the useful life is ended or the unit is no longer needed.

The devices have been successfully tested and approved by the Air Force at Andrews AFB, Underwriters Laboratories, Inc., and a large number of Building Code organizations. A check with your local supplier will certainly show compliance with all applicable local/state/federal codes.

In hazardous environments, these spark free, hermetically sealed devices stand up to vibration, dust, explosive gas, moisture, pressure, and temperature conditions that often threaten the dependability of conventional exit sign devices.

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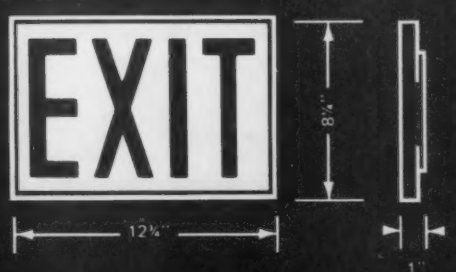
DIMENSIONS



an editorial

departments

By TED C. MURPHY
Professor Emeritus, CECOS
• Los Altos, Calif.

A perfectly good and honorable word is being destroyed before our very ears and the lexicon is poorer for it. You have heard the word used so often to describe so many different kinds of people that you have probably lost faith in its meaning, its utility, already.

The word is "dedicated."

Statistically it is used more often than any other word during ceremonies held to honor someone. I think I have heard it used to describe at least 350 men and two women. (Why so few women develop into the dedicated state I have no idea. "Biological infirmity," someone has said, although the Argentine official who said it with reference to Margaret Thatcher should have known better than to say it within the hearing of troops who proudly count among their monarchs Elizabeth, Victoria, and Bloody Mary. However, the "war" was over almost before it got started, leaving the Argentines plenty of time to ponder the nature of the masculine infirmities that ruined their carnival, completely.)

I once watched a fellow described by the speaker at a ceremonial luncheon as dedicated, just a few months before he went to jail for fraud; and he had gotten an A in an ethics course during his senior year at college ten years earlier. Must not have been a very good course. Probably only two units.

And I know of a doctor who was called dedicated at one point of his career and lost his license at another point for selling pills by the ton.

What it comes down to, if you think about it, is that everyone is dedicated. Everyone. Hitler was. Bluebeard was. Boccaccio's Decameron is loaded with dedicated men *and* women. Together. (In fact they were just about as dedicated as people *can* get, I believe.)

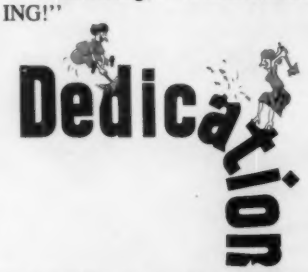
So I guess the question is: Dedicated to what?

Some ensigns I have known became dedicated — to the exclusion of all other considerations (even before they made JG) — to doing 20 effortlessly and retiring, and this is what they did. They retired as LCDRs, usually. Others I have known were — throughout their careers — dedicated to doing a PR job on those who wrote their fitness reports. It worked, sometimes; sometimes it didn't.

Surely you have seen this little episode: Senior officer, stepping along smartly in the a.m. on the way to his office, is met by subordinate officer to whom he says:

"Good morning, Smike. How are things going?" To which Smike, bright-eyed, wearing a broad smile and a mouthful of teeth, bubbles enthusiastically:

"Outstanding, sir. OutSTANDING!"



Not "Fine"; or "Very well"; or "O.K."; but "OutSTANDING"!

I have watched this happen when the work for which Smike was responsible was, to my direct knowledge (and everyone else's but the Old Man's) a complete shambles. No matter. This man's attitude and military bearing (and salutation in the a.m.) mark him as dedicated. And, of course, he is. But to what?

Then there is — ah, yes — the reorganizer. He is dedicated to the proposition that the way to the top is via high profile visibility; and he believes that this cannot be left to chance, but can be "arranged," if one puts his mind to it. He believes that an ounce of image is worth several pounds of performance.

First step: Suggest (to the right people) that the department's procedures seem unnecessarily awkward compared to those employed at his last duty station. After letting that simmer for a few weeks, second step: Raise questions about the department's efficiency, and cost-effectiveness, suggesting that significant improvements could be made if properly studied. Third step: Offer to make such a study and to prepare a written report thereof.

None of this, of course, is discussed with contemporaries; only with those in echelons above.

The written report he submits is complete with organization chart, procedural flow diagrams, functional statements. His contemporaries are shown in their reorganized billets. The reorganizer is not identified on the chart, but the central or control section head block is left vacant. What more natural place for the designer? (Modesty, etc.)

Sometimes the changes turn out to be more cosmetic than anything else; or simply trade off effectiveness for efficiency. Many a reorganization which had as its primary purpose the spotlighting of the reorganizer are undone quietly when he moves on, to the manifest relief of all.

I knew one officer who was so dedicated to the Navy that he forgot he was married. He had married a demure, small-town girl of 19 soon after graduation from the Academy. By the time she was 30 she decided she didn't like playing second violin and became an ardent, dedicated female chauvinist.

Her name was Eleanora. I don't remember his. He never made Captain, but you might say she did. At his retirement ceremony he was referred to — sure enough — as dedicated. Several times.

Eleanora smiled graciously throughout the whole ceremony and the reception which followed. When it was over and they drove away, I noticed that she was driving.

As I watched their car disappear, the truth of one of Mencken's most profound observations occurred to me: "A man may be a fool and not know it. But not if he's married." Even if he *is* dedicated. □

38 new officers assigned worldwide

*† **ENS John L Dettbarn, Jr.**
BSCE/Va. Polytech.
to Gulfport, Miss.

ENS Andrew M. Ashe
BSCE/New Hampshire U.
to Pearl Harbor, Hawaii

ENS Cynthia Bishop
BSCE/Colorado U.-Boulder
to Yokosuka, Japan

ENS Michael L. Blount
BSE/Florida U.
to Key West, Fla.

ENS Everett L. Butcher
BSOE/M.I.T.
to Mechanicsburg, Pa.

ENS Mark Casavantes
BA Arch./Southern Cal.
to Long Beach, Calif.

† **ENS Christopher B. Cashen**
BSCE/Purdue U.
to Little Creek, Va.

• **ENS Mason Crum**
MS/Vanderbilt U.
to Charleston, S.C.

LTJG Scott E. Dukette
BSCE/Rensselaer Polytech.
to Griffiss AFB, N.Y.

• **ENS Paula C. Dunn**
BSCE/Univ. of the Pacific
to Washington, D.C.

Thirty-eight new officers joined the ranks of the U.S. Navy's Civil Engineer Corps on March 4, 1983 upon graduation from the Naval School, Civil Engineer Corps Officers, Port Hueneme, Calif., and have accepted assignments all over the world.

The Class, Number 166, completed eight weeks of specialized training pertinent to the Navy's needs for shore installation engineering, public works management, and Seabee operations.

Six graduated with honors: ENS John L. Dettbarn, Jr. was the Outstanding Graduate. Five graduated with distinction: ENS Mason Crum, ENS Paula C. Dunn, ENS Sheila J. Hixenbaugh, ENS Paul V. McGuan, and LT Terrance L. Rayback.

ENS Dettbarn's photograph is indicated by (*). Students graduating with Distinction are indicated by (.) and those entering Seabee duty by (†).

ENS Steven R. Fredette
BIE/Georgia Tech.
to San Bruno, Calif.

LT Michael C. Freemyers
MSME/Purdue U.
to Argentia, Newfoundland

ENS William E. Furniss
BSCE/Valparaiso U.
to Adak, Alaska

ENS Jeanne E. Geisel
BAE/Penn State U.
to Gulfport, Miss.

LT Stephen L. George
BSEE/Oklahoma U.
to Washington, D.C.

ENS William G. Grip
BCE/Georgia Tech.
to Camp Lejeune, N.C.

ENS Carlos R. Hernandez
BSOE/Florida Atlantic
to Subic Bay, R.P.

• **ENS Sheila J. Hixenbaugh**
M Arch./Hawaii U.
to Guantanamo Bay, Cuba

ENS Blaine D. Johanneson
BSCE/North Dakota State
to Little Creek, Va.

ENS Robert B. Kahler
BSCE/Virginia Tech.
to Norfolk, Va.

ENS Robert H. Kienke
BSEE/VMI
to Norfolk, Va.

† **LT Curt W. Kronberg**
BSCE/Marquette U.
to Port Hueneme, Calif.

ENS Gregory S. Lang
BSCE/Cornell U.
to San Diego, Calif.

• **ENS Paul V. McGuan**
BSCE/Lawrence Inst. of Tech.
to Portsmouth, Va.

ENS David K. Mori
BSCE/Texas A&M
to Long Beach, Calif.

ENS Cannon L. Morse
BSCE/Illinois U.-Urbana
to Indian Head, Md.

ENS Michael W. Murphy
BCE/Manhattan College
to Manila, R.P.

ENS Penny L. Newcomb
B Arch./Va. Polytech.
to Camp Pendleton, Calif.

ENS Peter G. Newton
BSCE/Idaho U.
to Indian Head, Md.

LT Wiley E. Pipkin
BSCE/New Mexico U.
to Pensacola, Fla.

LT James L. Ray
BSEE/New Mexico State
to Long Beach, Calif.

• **LT Terrance L. Rayback**
BS Arch./Nebraska U.
to Philadelphia, Pa.

ENS C. Blake Sajonia
BSCE/Washington U.
to Little Creek, Va.

ENS Darrell M. Setser
BS Mining Eng./Arizona U.
to Panama Canal

ENS James R. Souba
BCE/Minnesota U.
to Yuma, Ariz.

ENS James P. Tranlong
BSME/Oregon State
to Washington, D.C.

ENS Stephen F. Tyahla
BS Env. Eng./Penn State
to Jacksonville, Fla.

ENS Thomas A. Williamson
BSCE/San Diego State
to Washington, D.C.

College Grads!

Time to make a career choice?

Consider the Navy's

Civil Engineer Corps

(See inside front cover for particulars)